ForeRunner ASN-9000
Software Reference Manual

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NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada label does not guarantee the equipment will operate to the user's satisfaction.

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TRADEMARKS

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Preface

This manual describes the *ForeRunner* ASN-9000 user interface and commands used to configure and manage the *ForeRunner* ASN-9000. Refer to the *ForeRunner ASN-9000 Filters Reference Manual* for details on creating and applying filters to control traffic received and transmitted by the ASN-9000. Refer to the *ForeRunner ASN-9000 Protocols Reference Manual* for details on configuring the communications protocols supported by the ASN-9000.

Chapter Summaries

Chapter 1 - Features Overview - Describes the software features of the *ForeRunner* ASN-9000.

Chapter 2 - Software Subsystems - Describes the Packet Engine boot PROM commands and the software subsystems available in the *ForeRunner* ASN-9000.

Chapter 3 - ASN-9000 Files - Provides information on the files that are shipped installed on the *ForeRunner* ASN-9000 and the files created within the *ForeRunner* ASN-9000.

Chapter 4 - Command-Line Interface - Describes how to interpret user interface screens. The command syntax is discussed with details on the more common noun / verb command combinations. A discussion is provided on the various ways to obtain on-line help while in a user session.

Chapter 5 - Global Commands - Describes the commands that are available in the global command subsystem of the *ForeRunner* ASN-9000. Global commands are commands that are available throughout the *ForeRunner* ASN-9000.

Chapter 6 - System Commands - Describes the commands available from the system subsystem. The system subsystem commands are commands that are used to control overall system parameters and environment.

Chapter 7 - Media Commands - Describes commands available in the media subsystem. Media subsystem commands are used to control physical media and bridging configuration.

Chapter 8 - NVRAM Commands - Describes the commands available in the nvram subsystem. The nvram subsystem commands can be used to make changes to the order in which the system boots as well as to configure the segments that a module slot can support.

Chapter 9 - Host Commands - Describes the commands available in the host subsystem. The host subsystem commands are used to set or display various TCP, TELNET and UDP information.

Chapter 10 - Bridge Commands - Describes the commands available in the bridge subsystem. The bridge subsystem commands are used to display and control bridging parameters in the *ForeRunner* ASN-9000.

Chapter 11 - SNMP Commands - Describes the commands available in the snmp subsystem. The snmp commands are used to configure the *ForeRunner* ASN-9000 to respond to commands from a system-level management system, i.e., *ForeView* or HP OpenView.

Chapter 12 - TFTP Commands - Describes the commands available in the tftp subsystem. The tftp subsystem commands provide an way to transfer files to / from the *ForeRunner* ASN-9000. Additionally, tftp commands can be used to configure the system to be booted remotely from a tftp boot server.

Chapter 13 - Telnet Commands - Describes the command available in the telnet subsystem. The telnet subsystem provides commands to initiate an outbound telnet session from the *ForeRunner* ASN-9000.

Related Publications

The following publications are referred to throughout this manual and comprise the ASN-9000 Reference manual set.

- *ForeRunner* ASN-9000 *Release Notes*, MANU0274-03, June 1, 1998.
- *ForeRunner* ASN-9000 *Installation and Maintenance Manual*, MANU0255-02, June 1, 1998.
- *ForeRunner* ASN-9000 *Filters Reference Manual*, MANU0280-02, June 1, 1998.
- *ForeRunner* ASN-9000 *Protocols Reference Manual*, MANU0273-02, June 1, 1998.

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   support@fore.com

3. Telephone questions to "support" at:

   800-671-FORE (3673) or **724-742-6999**

4. FAX questions to "support" at:

   724-742-7900

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+1 724-742-6999

No matter which method is used to reach FORE Support, customers should be ready to provide the following:

- A support contract ID number
- The serial number of each product in question

All relevant information describing the problem or question

Typographical Styles

Throughout this manual, all specific commands meant to be entered by the user appear on a separate line in bold typeface. In addition, use of the `Enter` or `Return` key is represented as `<ENTER>`. The following example demonstrates this convention:

`cd /usr <ENTER>`

File names that appear within the text of this manual are represented in the following style: "...the `fore_install` program installs this distribution."

Command names that appear within the text of this manual are represented in the following style: "...using the **`flush-cache`** command clears the bridge cache."

Subsystem names that appear within the text of this manual are represented in the following style: "...to access the **`bridge`** subsystem..."

Parameter names that appear within the text of this manual are represented in the following style: "...using *`<seg-list>`* allows the segments to be specified for which to display the specified bridge statistics."

Any messages that appear on the screen during software installation and network interface administration are shown in `Courier` font to distinguish them from the rest of the text as follows:

```
.... Are all four conditions true?
```

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To call attention to safety and otherwise important information that must be reviewed to ensure correct and complete installation, as well as to avoid damage to the FORE Systems product or to the system, FORE Systems utilizes the following *WARNING/CAUTION/NOTE* indicators.

WARNING statements contain information that is critical to the safety of the operator and/or the system. Do not proceed beyond a ***WARNING*** statement until the indicated conditions are fully understood or met. This information could prevent serious injury to the operator, damage to the FORE Systems product, the system, or currently loaded software, and is indicated as follows:

WARNING!

Hazardous voltages are present. To reduce the risk of electrical shock and danger to personal health, follow the instructions carefully.

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CAUTION

Damaging to the equipment and/or software is possible if these instructions are not followed.

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NOTE

The Laser Notice section applies only to products or components containing Class 1 lasers.

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- Follow all warnings and instructions marked on the equipment.
- Ensure that the voltage and frequency of the power source matches the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to the equipment.

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CAUTION

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WARNING!

FORE Systems products are shipped with a grounding type (3-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.

Command Syntax

The following expressions are used in this manual when describing command syntax:

AaBbCcDd A term that is being defined. Example:

IP Helper is an enhancement to the **ip** subsystem that allows a system to be boot from a server separated from the boot client by a gateway.

AaBbCcDd A command name. Commands are case-sensitive; they should always be issued in lowercase. Example:

```
dir
```

| 1) Separates the full and terse forms of a command or argument:

- The full form is shown on the left of the **|**.
- The terse form is shown on the right of the **|**.

Example:

```
dir | ls
```

When the command or argument is entered, either the full form or terse form may be used. In this example, either **dir** or **ls** can be used.

2) Separates mutually exclusive command arguments. Example:

```
active-ama|aa cset p[rimary]|b[ackup] <slot>|all
```

In this example, the command **active-ama|aa** can accept either **active-ama** or **aa**, but not both.

[ ] Enclose optional command arguments or options. Example:

```
active-ama|aa [show] [linemode|lm] <slot>|all
```

In this example, the **[ ]** enclose an optional argument. The command can be issued without the argument(s) shown in **[ ]**. However, if specified, the argument must be one of the two options listed between the **[ ]**.

<*AaBbCcDd*> Indicates a parameter for which a value is supplied by the operator. When used in command syntax, <*italics*> indicates the value to be supplied. Example:

savecfg <*filename*>

In this example, <*filename*> is a parameter for which a value must be supplied when the command is issued.

AaBbCcDd Indicates a field name or a file name.

An example of a field name is when booting the software, the `login:` prompt is displayed.

A filename example is when booting the software, the system looks for a file name `cfg`.

Indicates text (commands) displayed by the software or typed at the command prompt. To distinguish output generated from a command, the typed input is shown in bold typeface. Example:

```
16:ASN-9000:system# bootinfo
Tue Jan 20 15:46:25 1998 start
Tue Jan 20 15:46:34 1998 nvram boot order: fm
boot device: m
17:ASN-9000:system#
```

In this example, the user enters **`bootinfo`** and the software responds with:

```
Tue Jan 20 15:46:25 1998 start
Tue Jan 20 15:46:34 1998 nvram boot order: fm
boot device: m
17:ASN-9000:system#
```

CHAPTER 1 Features Overview

This chapter provides an overview of the major features of the *ForeRunner* ASN-9000. The features discussed include:

- Intelligent Packet Switching
- Software
- Network Management

1.1 Intelligent Packet Switching

Much of the packet switching in the ASN-9000 is performed by the Packet Engine (PE). The PE is the centralized packet processing and forwarding engine of the ASN-9000. When a packet is received on a segment, the packet is forwarded to the PE and placed in Shared Memory where it is examined and either dropped or forwarded, as applicable. The ASN-9000 utilizes the first generation Packet Engine, Packet Engine (PE).

1.1.1 Packet Engine

The processors on board the PE contain the bridging and routing engines that intelligently examine packet headers for bridging and routing, and modifying them as required for routing. When a non-intelligent Network Interface Module (NIM) receives a packet from one of its ports, it places the packet on the Packet Channel and transfers it directly to the shared packet-buffer memory on the PE.

The Main CPU (MCPU) in the PE examines the source and destination addresses in the packet to determine the segments to which the packet needs to be forwarded and the modifications, if any, to be made to the packet. After the necessary modifications are performed, the Input Output/Processor (IOP) queues the packet for transmission on the appropriate destination port(s).

The PE is also responsible for maintaining complete routing and bridging tables. Caches of route and bridge tables are distributed to intelligent NIMs, which make forwarding decisions locally and use the IOPs to queue the packets to the appropriate NIM.

1.1.1.1 Packet Engine (PE)

PE contains the following major features:

- Supports all currently supported NIMs.
- Contains three 40MHz RISC (64bit internal-32bit external) processors, each with specialized functions: one MCPU and two IOPs. Installing a packet Accelerator adds another MCPU, increasing the number of processors to four, similar to the PE2 (refer to Section 1.2.1).
- Supports the two 800Mbps packet channels of the Packet-Channel Backplane found in the ASN-9000 for a peak bandwidth of 1.6 Gbps. These high-speed channels are implemented and controlled through the incorporation of ten proprietary ASIC devices.

1.1.2 Network Interface Modules (NIMs)

The ASN-9000 supports ATM interfaces through the use of the PowerCell 700 ATM Intelligent Network Interface Module (INIM). The following paragraph provides an overview of the ATM PowerCell INIM. For a detailed description of the ATM INIM, refer to the *ForeRunner ASN-9000 Hardware Reference Manual.*

1.1.2.1 ATM Modules

The PowerCell 700 ATM INIM supports up to two ATM Media Adapters (AMAs). These AMAs can support various physical (PHY) ATM interfaces. The interfaces available include OC-3 Single-Mode Fiber (SMF), OC-3 Multimode Fiber (MMF) and OC-3 Unshielded Twisted-Pair (UTP). If two AMAs are installed, one can be configured as a primary port while the other can be configured as a backup port.

1.2 Software Features

The following software features are supported in the *ForeRunner* ASN-9000. This section describes the features that can be found in the ASN-9000 software. The focus of this section is on system management, rather than configuration and management of network interfaces. The following subjects are discussed:

- Multiprocessor Optimization
- Boot Sources
- Command-Line Interface
- File Management System
- Concurrent Command-Line Sessions
- Configuration Files
- Parameter Files
- Automatic Segment-State Detection
- Segment Statistics
- Traffic Monitoring
- Virtual Local Area networks (VLANs)
- Bridging and Routing
- Route Protocol Statistics
- Security Filters

1.2.1 Multiprocessor Optimization

Multiprocessor optimization minimizes the latency caused in the normal packet-forwarding functions due to the processing of management events. By moving these processing-intensive functions to a separate MCPU, the latency of packets in the fast path can be kept to a minimum.

This feature is dependent on having a PE with a Packet Accelerator installed. With the accelerator installed, there are four CPUs available. Without the multiprocessor optimization feature, only three CPUs are used. This feature makes use of the fourth CPU by splitting the functions of the single MCPU.

Multiprocessor Optimization moves all of the fast-path packet processing to one MCPU and retains the slow path and management functions on the other MCPU. Multiprocessor optimization automatically detects the presence of an Accelerator Card at boot time and operates in the appropriate mode. Without the Accelerator Card, the system uses only one MCPU for all functions.

1.2.2 Boot Sources

The ASN-9000 can be configured to boot from one or two sources: floppy diskette (fd) or the Flash Memory Module (fm) .. Failure of the primary boot source can be prevented by configuring a boot order in Non-Volatile Random Access Memory (NVRAM).

1.2.3 Command-Line Interface

The ASN-9000 is managed through a DOS/UNIX-like command-line user interface. Commands can be issued from a management terminal attached to directly through a TTY connection on the PE or indirectly through an in-band TELNET connection. Refer to *Chapter 2, Software Subsystems* for a discussion of the software subsystems. Refer to the appropriate section of this manual for discussions of the commands available in each subsystem. Refer to the *ForeRunner ASN-9000 Protocols Software Reference Manual* for discussion of the protocol-related subsystems commands.

1.2.4 File-Management System

The ASN-9000 contains global commands to display, copy, rename, and remove files stored on a floppy diskette or in the Flash Memory Module. The file management global commands provide the ability to calculate checksum values of files (**`checksum`**) and display directory and volume information (dir|ls). Text files on an ASN-9000 can also be displayed to the operator console using the **`type|cat`** command. Additionally, the Flash Memory Module can be reformatted if necessary.

1.2.5 Concurrent Command Line Sessions

Up to four management sessions can be open at the same time. The primary session is always the session on TTY1, a second TTY session can be opened on TTY2. In addition, up to two TELNET sessions can be open simultaneously.

1.2.6 Configuration Files

Configuration changes effected through software commands can be preserved by saving the changes in a configuration file. Changes saved to the file name **`cfg`** are automatically applied and, following a software reboot, provided the **`cfg`** file is present on the boot source applied to the new session.

1.2.7 Parameter Files

Commands can be issued to modify parameters that control user sessions. These parameters include scroll control, TELNET control characters, command aliases, and timed commands. If session parameters are not saved in environment files, these parameters will be lost when the session is closed.

Environment files can be saved so that the same conditions can be made available in another user session. The environment file can then be read (loaded), reinstating the session parameter changes that were stored in the environment file.

If an environment file is saved under the name `root.env`, it is automatically loaded whenever the system is logged into under root status. Likewise, environment files saved under the name `monitor.env` are automatically loaded when logging on with monitor status or if the user level is changed from root to monitor during a session.

1.2.8 Automatic Segment-State Detection

When enabled, Automatic Segment-State Detection senses when a link (or something configured on the link) is "bad" or "down." When a "bad" or "down" link is detected on a particular port, the state of the segment is reflected in the software's interface tables. *ForeView* Network Management software allows link types to be enabled or disabled on a particular port. Through *ForeView* the state of the following link types can be learned:

- AUI
- MAU RPTR
- MAU
- BNC
- BNCT
- 10Base-T
- Fiber
- Unknown

To disable automatic segment state detection on a UTP port, rename the configuration file to something other than **`cfg`** and then reboot the system.

1.2.9 Segment Statistics

Access method and protocol statistics related to segment and packet activity can be displayed. For example, state-change statistics for individual segments can be displayed to show how many times a particular segment has gone up or down since the software was last booted. Statistics related to protocols are briefly described in Section 1.2.13.

1.2.10 Traffic Monitoring

Port activity can be monitored at regular intervals. For example, statistics of packet activity or packet errors and collisions on a particular port can be monitored and graphed.

1.2.11 Virtual Local Area Networks (VLANs)

A Virtual Local Area Network (VLAN) is a collection of segments that share the same group name or interface address. Layer-2 VLANs are created by creating a bridge group. The software comes with a default bridge group called **`default`** that contains all installed ASN-9000 segments.

Layer-3 VLANs can be created by assigning the same IP, IPX, or AppleTalk interface address to multiple segments. When the software determines a packet is to be sent to a Layer-3 VLAN assigned to multiple segments, the software forwards a copy of the packet on each segment. From a physical perspective, when this happens, a separate packet is sent to each physical interface. From a logical standpoint, however, the forwarded packet has been forwarded onto its single destination network or subnet, irrespective of how many physical interfaces that network or subnet is configured on.

1.2.12 Bridging and Routing

The `bridge` subsystem contains commands for configuring and managing the ASN-9000 as an IEEE 802.1d bridge. Up to 32 network (bridge) groups can be defined, each containing any subset of ASN-9000 segments.

1.2.12.1 Bridge Table and Cache

The software maintains a bridge table containing the MAC-layer hardware addresses of devices to which the ASN-9000 is able to bridge packets. The software maintains this table by automatically adding new entries and deleting unused entries. In addition, individual entries can be added or removed, including entries that support multi-homed hosts.

Following is an example of a bridge table. Although only a handful of bridge entries are shown in this example, the bridge table usually contains many entries.

```
98:ASN-9000:bridge# bt
```

```
Bridging table (aging time = 60 minutes)
Ethernet-address   Seg   Rule  Flags
00-60-08-b0-97-04  2.1   none
00-00-ef-03-9a-b0   --   none  system permanent
08-00-20-7d-e1-7d  2.1   none
.
.
.
00-a0-24-17-3d-9a  2.1   none
00-a0-98-00-09-d3  2.1   none
00-a0-d1-01-ed-7f  2.1   none
ff-ff-ff-ff-ff-ff   --   none  permanent bmcast

Total entries: 97, Learned entries: 95, Permanent Entries: 2
99:ASN-9000:bridge#
```

In addition to the bridge table, the software maintains a bridge cache of the most recently used source-destination pairs. A source-destination pair contains a packet's source and destination MAC-addresses. The bridge cache provides a fast path for the bridging software and gives an at-a-glance view of current bridging activity. The bridge cache can be displayed to see the source-destination pairs that are frequently used.

1.2.12.2 802.1d

The ASN-9000 can be used "right out of the box" as an 802.1d Bridge. The designation 802.1d refers to the IEEE specification for this type of bridge. For more information regarding 802.1d bridging, refer to Request for Comments (RFCs) 1493 and 1525.

1.2.12.3 Spanning-Tree

The bridge software includes implementation of the 802.1d Spanning-Tree (ST) algorithm. When enabled, the software identifies and "breaks" loops in the network without requiring configuration changes. Commands in the `bridge` subsystem allow fine-tuning of the ST parameters to fit network needs.

1.2.12.4 IP Routing

Commands in the `ip` subsystem allow segments to be configured for IP routing. Using `ip` commands, IP interfaces can be assigned to individual segments. The IP routing software also supports IP VLANs, enabling a single IP subnet that spans multiple segments to be defined. The following subsections describe major features of the `ip` subsystem. Refer to the *ForeRunner ASN-9000 Protocols Reference Manual* for more information about these features and the `ip` commands.

1.2.12.4.1 Routing Information Protocol (RIP)

The `ip/rip` subsystem commands enable the ASN-9000 to perform IP routing. Using commands in this subsystem, RIP parameters such as `talk` and `listen` can be configured on a segment-by-segment basis. Statistics for RIP packets can also be displayed.

1.2.12.4.2 Open Shortest Path First (OSPF)

The `ip/ospf` subsystem contains commands that can be used to configure the ASN-9000 as an Open Shortest Path First (OSPF) router. OSPF is a routing protocol that enables each participating router to use a topological map of the network to route packets. OSPF routers exchange route information using link state advertisements (LSAs). An LSA is a packet that reports the link state (up or down) of a router's interfaces that are attached to devices in the OSPF network.

1.2.12.5 AppleTalk Routing

The `atalk` subsystem contains commands that can be used to configure ASN-9000 segments for AppleTalk Phase-2 routing. AppleTalk zones and interfaces can be defined as well as commands to ping AppleTalk nodes.

1.2.12.6 IPX Routing

The ASN-9000 can be configured and managed as an IPX router. In addition, the software provides management information on IPX routers and servers through implementation of IPX Routing Information Protocol (RIP) and Service Advertisement Protocol (SAP). RIP or SAP `talk` and `listen` parameters can be enabled selectively on a per-segment basis to control the flow of RIP and SAP updates.

1.2.12.7 DECnet Routing

The **dec** subsystem contains commands for configuring the ASN-9000 to perform DECnet Phase IV routing. Depending on the configuration of the network, the system can be configured to function as a Level-1 or Level-2 router. DECnet statistics for the system (in its capacity as a DECnet node) and for the individual segments configured as DECnet interfaces can also be displayed.

1.2.13 Route Protocol Statistics

The ASN-9000 can gather statistics for the following Internet routing protocols:

- AppleTalk
- Bridge
- DECnet
- IP
- IPM
- IPX
- OSPFv2
- RIP
- SNMP
- TCP
- TCP/IP

1.2.14 Security Filters

Filters to can be defined and applied to segments or protocol interfaces to control the traffic sent and received on the segments or interfaces. The following types of filters can be defined:

- Bridge filters
- Host (TCP) filters
- IP filters
- IP route filters (RIP and OSPF)
- AppleTalk filters
- IPX RIP and SAP filters

1.3 Network Management Features

The ASN-9000 has a rich management environment providing comprehensive support for Simple Network Management Protocol (SNMP) as well as local RS-232 and Telnet console support. *ForeView* graphical network management software provides true point-and-click device configuration and runs on a variety of popular management stations.

1.3.1 Network Management System (NMS)

The Network Management System (NMS) manages the ASN-9000 by sending requests to a software module, or agent, to change the value of one or more variables on the device. For example, an agent reports data such as the number of packets sent, received or dropped on that device. Then, the managed device and the NMS use SNMP as the common protocol language to exchange the information requested by the NMS.

1.3.2 Management Information Base (MIB) Agents

Management Information Base (MIB) agents contain definitions of all resources (represented by managed objects) within the MIB that are managed by a network management system (NMS). The managed object has properties that hold values such as routing table information and error counters.

1.3.3 ForeView

ForeView is a graphical-based management application tool for managing the ASN-9000. With a point-and-click interface, *ForeView* provides access to ASN-9000 functions at both the system and segment level. *ForeView* can control the ASN-9000, monitor errors, control bridge and routing configuration parameters, and display, print, and save statistics.

ForeView integrates the ASN-9000 system, bridge, and router features into a single application with access and control of all information from one location.

Statistics are shown in graphical formats, and the physical attributes, such as model and segment type are displayed on the front panel of a graphical representation of the ASN-9000. The graphical representation is displayed when *ForeView* is started. For more information about the *ForeView* Network Management application, refer to the *ForeView Network Management User's Manual*.

CHAPTER 2 Software Subsystems

This chapter describes the ASN-9000 platform software, which controls the operation of the ASN-9000. This software is comprised of firmware, located in the Boot PROM on the Packet Engine, and runtime software, which is loaded into the Flash Memory Module of the *ForeRunner* ASN-9000.

2.1 Firmware

Firmware commands are available to the user if the normal boot process is aborted at the 5-second delay prompt. A typical boot screen display is shown in Figure 2.1.

```
Starting Packet Engine ...
Prom version: pe1p-3.0.0 (7887) 1998.05.06 13:01
I-cache 16KB OK
Entering cached code
I-cache execution OK
D-cache 4KB OK
SRAM 128KB OK
DRAM 24MB OK
Shared Memory 4MB OK
Entering Monitor

FORE Systems ASN-9000
FlashInit: found 4MB Flash Memory Module
Board Type: 9PE ,  CpuType: MCPU,  Instance: 1
Ethernet address: 00-00-ef-03-9a-b0

(normal start)

Hit any key now to abort boot [4]:

<PROM-9PE>
```

Figure 2.1 - ASN-9000 Boot Screen Display

The available Boot PROM commands, that the user would normally access, include:

```
<PROM-9PE> ?
COMMANDS:
       boot:           boot|b [-n] [fd|net|fm]
       copy file:      copy|cp <src-file> <dest-file>
                       -or-
                       copy|cp <src-file> [<src-file>...] <device>
       ethaddr:        ethaddr|ea
       help:           help|? [COMMAND]
       expert help:    ??
       ls:             ls|dir
       more:           more [-[<rows>]] f1 [f2...[fn]]
       nvram:          nvram [set|unset|show <variable> [<value>]]
                       ("nvram set bo" sets disk/net boot order)
       remove file:    rm|del [-f] f1 [f2...[fn]]
       rename file:    rename|ren <oldfilename> <newfilename>
       zmodem receive: zreceive|zr|rz [-+27abcehtw] [<filename>]
       zmodem send:    zsend|zs|sz [-+27abehkLlNnoptwXYy]
<PROM-9PE>
```

Additional commands can be found under expert help, which is accessed by entering two question marks (**??**). Most of the commands located under expert help should not be used unless directed by FORE Systems TAC. Some of the commands can be used to upgrade the Packet Engine firmware. Any commands pertaining to normal operation of the ASN-9000 are discussed in detail, in the ForeRunner ASN-9000 *Hardware Reference Manual*. Commands used by FORE Systems TAC are not discussed.

2.2 Runtime Software

The commands used to configure or exercise ASN-9000 features are grouped into subsystems. Each subsystem contains commands pertaining to a particular aspect of ASN-9000 configuration or management. Issuing the **`subsystems|ss`** command, displays a list of all available subsystems. Issuing **`help`** or **`global help`** from a system prompt, displays a list of commands that can be executed at the current prompt. The following subsystems are supported in the ASN-9000 UI.

Table 2.1 - Subsystems

Subsystem	Description	Refer To
`global`	System-wide commands	Chapter 5, “Global Commands”
`system`	Display and manage hardware configuration items, manage file, save, and load configuration files. Default subsystem when powering on the system.	Chapter 6, “System Commands”
`media`	Define information about physical links.	Chapter 7, “Media Commands”
`nvram`	Non-Volatile Random Access Memory (NVRAM)	Chapter 8, “NVRAM Commands”
`host`	Define and display TELNET control characters, display active TCP connections and UDP agents	Chapter 9, “Host Commands”
`bridge`	Bridging, Spanning-Tree, and IPX translation bridging	Chapter 10, “Bridge Commands”
`snmp`	Simple Network Management Protocol (SNMP)	Chapter 12, “SNMP Commands”
`tftp`	Trivial File Transfer Protocol (TFTP)	Chapter 13, “TFTP Commands”
telnet	Outbound Telnet	Chapter 14, “Telnet Commands”
`atalk`	AppleTalk	ForeRunner ASN-9000 Protocols Reference Manual
atm	Asynchronous Transfer Mode (atm)	ForeRunner ASN-9000 Protocols Reference Manual

Table 2.1 - Subsystems

Subsystem	Description	Refer To
dec	DECnet	ForeRunner ASN-9000 Protocols Reference Manual
ip	Internet Protocol (IP), IP / RIP, IP / OSPF	ForeRunner ASN-9000 Protocols Reference Manual
ipx	IPX, IPX / RIP and IPX / SAP	ForeRunner ASN-9000 Protocols Reference Manual

As noted in the 'Refer To' column, the subsystems that deal with setting up interface protocols are explained in the *ForeRunner ASN-9000 Protocols Reference Manual*. Additionally, those commands dealing with setting up filters are explained in the *ForeRunner ASN-9000 Filters Reference Manual*.

CHAPTER 3 ASN-9000 Files

This chapter describes the software used by the ASN-9000 and the files that are shipped with the ASN-9000. The user is advised to contact FORE Systems TAC if it is necessary to upgrade any of the system software or firmware.

3.1 File Types

The following types of software are utilized:

Packet Engine Boot PROM Contains firmware used by the Packet Engine when it is booted. From this PROM, configuration values, including the boot source, can be changed and stored in NVRAM. Refer to the *ForeRunner ASN-9000 Hardware Reference Manual* for details on the Boot PROM commands. The boot PROM prompt is displayed as:

```
<PROM-PE1>, for the ASN-9000
```

System software Sometimes called "runtime software." The runtime software is accessed from the runtime command prompt. Refer to the appropriate chapter of this manual for detailed information on the commands available in the subsystems of the system software. Refer to the *ForeRunner ASN-9000 Protocols Reference Manual* for details on configuring protocols. Refer to the *ForeRunner ASN-9000 Filters Reference Manual* for details on configuring filters. The default runtime prompt is displayed as:

```
1:ASN9000:
```

INIM PROM Intelligent Network Interface Modules (NIMs) (contain a PROM whose firmware is used by the module when it is booted. The NIM PROM cannot be interacted with directly.

Runtime PROM Contains runtime features used by intelligent NIMs. The runtime PROM firmware is stored on the NIMs.

3.2 System Software

The current version of ASN-9000 firmware and software is shipped already installed. All required software and firmware is installed on the Packet Engine and all installed NIMs. The following sections describe the software and firmware that may be installed on theASN-9000. Specific software/firmware actually installed depends on the ASN-9000 model and installed INIMs.

3.2.1 ASN-9000

`PE1` System software image file: this file resides on the boot source and gets loaded when the system is loaded.

`ATM-PE1` Runtime PROM image for PowerCell 700: An instance of the appropriate file resides in a PROM on the intelligent module itself. The software is automatically booted.

3.2.2 Other Files

Additional files that may be installed on the ASN-9000 are files that are used for testing the system.

`bootdef` Used by the system when the software is booted to identify the name of the system software image, configuration file, and/or boot source.

`dispcfg` Configuration file that runs a series of commands that display system configuration information and statistics. This file is useful to assist FORE Systems TAC in diagnosing configuration problems.

3.2.3 Created Files

In addition to the files that are shipped installed on the system, the following files can be created and saved during a session:

`cfg` Configuration file: created when issuing the **`system savecfg cfg`** or **`tftp savecfg cfg`** command. The configuration file can be saved under any DOS-compatible filename, but the configuration must be manually loaded unless the user also edits the `bootdef` file to contain the configuration file name.

`root.env`	Environment file for root sessions: created when issuing the **`saveenv root.env`** command. Environment files can be saved under any DOS-compatible filename but must be manually loaded.
`monitor.env`	Environment file for monitor sessions: created when issuing the **`saveenv monitor.env`** command. Environment files can be saved under any other DOS-compatible filename but must be manually loaded.
`.dmp`	Dump file: created if a system crash is experienced.
`iop1.dmp`	Another type of dump file the software can produce when a crash is experienced.
`iop2.dmp`	Another type of dump file the software can produce when a crash is experienced.

The dump (.dmp) files should be supplied to FORE Systems TAC when reporting system crashes. The contents of these dump files assist TAC determine the cause of the crash.

CHAPTER 4 Command-Line Interface

This chapter describes the User Interface (UI) command-line, command syntax, various ways to display on-line help and levels of on-line help that are available.

4.1 Using the User Interface (UI)

The user interface (UI) comes up by default in the **system** subsystem when initially loaded. The following sections describe the subsystem command line prompt and how to issue commands.

4.1.1 Runtime Prompt

Regardless of whether the system is being accessed through one of the TTY (RS-232) ports or through an active TELNET session, the command prompt is displayed as shown in Figure 4.1:

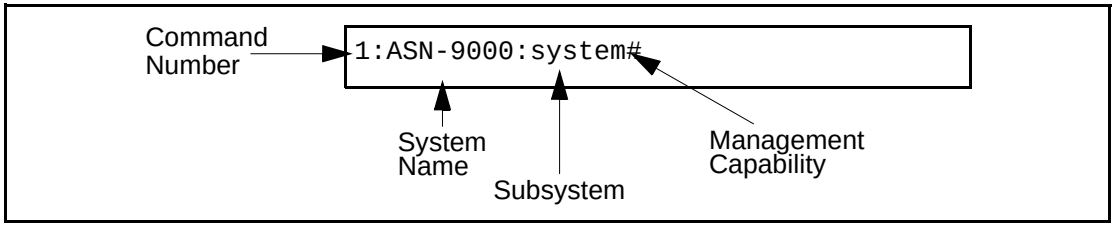

Figure 4.1 - Command Line

As shown in Figure 4.1, the command prompt contains four components:

Command Number Sequential line number of commands executed during the active session (similar to a command number in the UNIX C-shell). In this example, the command number is1.

When a carriage return (`Enter` key) is issued, the ASN-9000 attempts to execute the command entered at the command prompt. A message, or data (if requested), is displayed, then a new command prompt is displayed. The number in the command prompt increments by one from the previous command prompt.

System Name Name assigned to this ASN-9000. The default name can be changed by using the **`system sysname`** command (refer to Chapter 6).

Subsystem Name of the current subsystem. Commands issued at the command prompt must either be global commands or commands available within the current subsystem. In this example, the subsystem is `system`, the initial subsystem.

Access Level Indicates the level of access granted for this session.

>Indicates monitor level capability. *Monitor* capability is a display-only capability. Statistics and configuration information can be displayed. Commands that could change the configuration, clear statistics, or modify internal tables are not allowed.

#Indicates root level capability. *Root* capability allows commands to be issued that can change the configuration and clear statistics.

In this example, the current session is at the root access level.

If a session is started and the `login`: prompt is displayed, root or monitor must be entered, followed by a password before being allowed to proceed. Refer to Chapter 6 for information on changing or assigning passwords.

4.1.2 Entering and Editing Command Lines

All commands are entered at the command prompt using a workstation, terminal, or PC as a management station. The workstation, terminal, or PC must be attached to one of the TTY ports or connected through an active TELNET session.

Commands and arguments are case-sensitive and should be entered only as shown in the manual or on-line help. Commands must not exceed 128 characters in length. The keys used to edit and issue commands are the standard keys used on most UNIX workstations:

- To issue a command, enter the command and any options or arguments (if needed or required) at the command prompt, then press the `<Enter>` key.
- To erase individual characters in a command, use the `<Backspace>` or `<Delete>` key, or the `EraseChar` character assigned in the TELNET session (`<Ctrl+H>`).
- To cancel an entire line of input, use the reassign character (`<Ctrl+U>`).
- To control the scrolling of output on the terminal, use `<Ctrl+S>` to stop the flow and `<Ctrl+Q>` to resume the flow.

The global command **`stty`** provides options and arguments to change the key sequences used during TELNET sessions. The key sequences for the current session or the default key sequences used for all sessions can also be displayed or changed. Refer to Chapter 5, for information on the **`stty`** command.

4.2 Command Syntax

The command syntax is comprised of verbs, nouns and parameters. Understanding what each syntax component can do is important in understanding how to issue commands.

4.2.1 Verb Objects

The command verbs described in the following paragraphs consist of:

- set / unset
- define / undefine
- attach / detach
- enable / disable
- show / clear

4.2.1.1 set and unset

`Set` and **`unset`** apply or remove settings. Some examples include:

- Boot order (the device from which the system attempts to load the runtime software).
- Scroll control (stty) parameters
- Timed commands
- Routing protocols
- Specific bridging and routing protocol features

When the **`set`** or **`unset`** verb is prepended by **`c`**, **`p`**, **`n`** or **`s`**, it applies only to specific segments (**`c`**,**`p`**) or networks (**`n`**,**`s`**).

4.2.1.2 define and undefine

`Define` and **`undefine`** are primarily used when creating or deleting filter templates, rules and / or filters themselves. Refer to the *ForeRunner ASN-9000 Filters Reference Manual* for detailed information on the use of **`define`** and **`undefine`**.

4.2.1.3 attach and detach

`Attach` and **`detach`** are primarily used to apply or remove templates, rules and / or filters to segments or interfaces. Refer to the *ForeRunner ASN-9000 Filters Reference Manual* for detailed information on the use of **`define`** and **`undefine`**.

4.2.1.4 add and delete

Add and **delete** are used to add or delete objects to or from tables or to add or delete interfaces. Examples include bridge-table entries, protocol interface-table entries (IP, AppleTalk, IPX, and DECnet), and route-table entries.

4.2.1.5 enable and disable

Enable and **disable** turn on or off specific features. Examples include bridging and protocol routing, specific IP routes and IP Helpers. When the **enable** or **disable** verb is prepended by **p**, **n** or **s**, the verb applies only to specific segments (**p**,**s**) or networks (**n,s**).

4.2.1.6 show and clear

Show and **clear** are used to display or clear configuration information, tables, caches, and statistics. With these verbs, configuration information or statistics can be displayed, cleared, or reset to zero (0).

4.2.2 Noun Objects

The command structure contains many nouns. Some of the more commonly used nouns are described in the following paragraphs. This is a non-inclusive list of available nouns. Entering **help|?** at a subsystem prompt displays a complete list of nouns available in the respective subsystem.

4.2.2.1 config

The **config** command displays configuration information relative to the current subsystem on hardware and interfaces. In general, the **config** (**config [show]**) command displays parameters that have been configured through the software. Notice the **[show]** verb is enclosed in brackets. Whenever a noun, verb or part of a noun or verb is displayed in brackets, the portion in brackets is not required for the command to be executed. This portion of the command is assumed if omitted from the command line. Entering **config** or **config show** produces the same end result.

4.2.2.2 status

The **status** command displays the current status of the hardware such as segment up / down status, port status, the current bridge status of segments (bridging enabled or disabled, Spanning Tree enabled or disabled). In general, configuration parameters are displayed when the **status** (**status [show]**) command is issued.

4.2.2.3 stats

The **stats** command displays the statistics related to the current, or specified, subsystem. When **stats**, (**stats [show]**) is issued, statistics related to the area in the current subsystem (or specified subsystem if different from the current) are displayed. For example, the **stats** command issued from within the **ip** subsystem displays the current IP, ARP, and ICMP packet statistics.

4.2.2.4 interface

The **interface|it** command configures an interface in the current protocol. Typically there are **add**, **delete,** and **show** verbs accompanying this noun.

4.2.2.5 route

The **route|rt** command is used to manually add a route to an IP, IP Multicast, AppleTalk, IPX, or DECnet protocol session. Typically there are **add**, **delete**, **show**, **enable,** and **disable** verbs accompanying this noun.

4.2.2.6 cache

The **cache** command displays or clears cache entries in the current subsystem. The bridge subsystem and all routing protocol subsystems contain a cache command. The cache provides a "fast-path" entry, which is used as a shortcut to bridge or route packets. When a bridge table or route table is in the fast path, the ASN-9000 does not need to perform all the bridging or routing processing that it normally performs in order to bridge or route a packet. Each cache is maintained by placing in it the most recently used source/destination MAC-address pairs (for bridging) or protocol interface addresses (for routing).

4.2.3 Parameters

Most command nouns and verbs can be modified with parameters to further define what the command is to accomplish. Where the parameter falls in relation to the noun and/or verb depends on the type of parameter. The ASN-9000 supports keyword and positional parameters.

4.2.3.1 Keyword Parameters

Keyword parameters can be entered at any point following the verb.

4.2.3.2 Positional Parameters

Positional parameters must be entered in a specific position following the use of the verb. The need for positional parameters in the UI is infrequent because the software uses keywords to determine the function being performed. When the need for a positional parameter arises, the software provides a response (`usage:`) statement, showing the proper syntax.

4.3 On-line Help

Entering **help|?** at the command prompt, displays the commands that can be executed at that level. The example below shows a sample display produced by this command:

```
2:ASN9000:system# help

system subsystem:

        baud                                    readcfg|rdcfg
        bootinfo|bi                             reboot
        card-swap|cs                            savecfg|svcfg
        config                                  syslocn
        convert-config|ccfg                     sysname
        date                                    temperature|temp
        dcd-detection|dcd                       tty2
        ethaddr|ea                              uptime
        idprom|idp                              version|ver
        passwd

                type 'global help' for global commands

                type 'shex' to show an example of configuration

3:ASN9000:system#
```

As shown in the display below, entering **global help** displays the global commands, and entering **shex** provides examples on configuring theASN-9000. This information is displayed whenever **help|?** is entered from any command prompt. Entering **global help** and **she**x results in the following displays:

```
236:ASN9000:system# global help

global subsystem:

        alias                                   rcprompt
        checksum                                readenv|rdenv
        copy|cp                                 rename|mv
        default-device|dd                       rm
        dir                                     saveenv|svenv
        format|fmt                              show-config-example|shex
        help|?                                  stty
        history|hi                              su
        histchars                               subsystems|ss
        logout|bye                              timedcmd|tc
        ls                                      type|cat
        pnm                                     unalias
```

```
237:ASN9000:system# shex

The following shows a short example to configure ip interface

               ip vlan add 200.200.200.200 2.1   (add a vlan on segment 2.1)
               ip it add 200.200.200.200 200.200.200.200  (add an ip interface)
               ip enable   (enable ip forwarding)

The following shows some commands in subsystem "bridge"

               bridge br penable  2.1   ("port" enable bridging on seg. 2.1)
               bridge br pdisable 2.2   ("port" disable bridging on seg. 2.2)
               bridge st enable   (enable spanning tree)
               bridge st disable  (enable spanning tree)

In summary, there may be "enable/disable" and their derives
such as "penable/pdisable", "senable/sdisable", and etc.
to set a particular feature on and off
Use "help [cnps]enable" and "help [cnps]disable" in each
subsystem to see what can be set on/off.

238:ASN9000:system#
```

4.3.1 Syntax Help

Syntax help is provided when an incomplete or incorrect command is entered. Entering a command that requires additional options or arguments without providing these options or arguments, or entering them incorrectly, will prompt a usage statement indicating the correct parameter syntax. For example, entering **`idprom|idp`** at the `system` command prompt displays the following usage statement:

```
3:ASN9000:system# idp
usage:
       idprom|idp [show] <slot number>|all
4:ASN9000:system#
```

Detailed help on a command can be provided by entering **`help|?`** and the specific command.The example below shows a sample display produced by this command:

```
240:ASN9000:system# ? readcfg

readcfg|rdcfg [-v] <file or device name>

       -v : verbose: print each command as it is executed

       Reads the configuration from the specified file or device
       For auto-configuration on boot up, use the file name 'cfg'
       NOTE: The last line in any configuration file must be the string
       'endcfg' or 'ecfg'

241:ASN9000:system#
```

The display produced by this help command shows the syntax required to successfully execute the command. The display also provides a brief description of the options/arguments used with the command and explains what the command is intended to perform. Depending on the command, additional information by also be provided, as shown in the **readcfg** command above.

With some commands, there are numerous command verbs available. Such commands as **interface** may contain the **add**, **delete,** and **show** verbs. Entering **help|? interface** results in a display similar to the following:

```
242:ASN9000:ip# ? interface

Help available for:

       it|interface add <vlanid> <ipaddr>[/<prefixlen>|<mask>]
              [ ift[ype] b[c] | n[bma] | [p[top] <nbr_addr>] ]
       it|interface del[ete] [-p] <vlanid> <ipaddr>|all
       it|interface [show] [<disprestrictors>]

You may obtain more detailed help by giving additional parameters

243:ASN9000:ip#
```

The previous display shows all of the syntax available for use with the **ip interface** command. Additional help on each of the various options can be obtained by entering **help|? interface** and the verb as shown in the following example.

```
243:ASN9000:ip# ? interface add

it|interface add <vlanid> <ipaddr>[/<prefixlen>|<mask>]
       [ ift[ype] b[c] | n[bma] | [p[top] <nbr_addr>] ]

       Add an IP interface to the given vlan. If <mask> is not specified
       then "natural" subnet mask (class A, B, or C address mask) for the
       IP address is used. Interface type can be one of broadcast, nbma
       and ptop. Neighbor address must be specified only for ptop type.
       If interface type is not specified, broadcast is assumed by default.

244:ASN9000:ip#
```

4.3.2 Help Set

Entering **help|? set** at any subsystem prompt displays those commands along with global commands available in the present subsystem that use the command verb **set** as part of the command syntax. Use of this help option can save the user time in searching for the particular **set** command to perform a particular function.

```
245:ASN9000:system# ? set

Help available for:

pnm set multi|old
pnm [show]
default-device|dd set <device>
baud set tty1|tty2 1200|2300|4800|9600|19200
baud [show]
date set [YYMMDD]hhmm[.ss]
date [show]
syslocn set <location>
syslocn [show] <location>
sysname set <location>
sysname [show] <location>

You may obtain more detailed help by giving additional parameters

246:ASN9000:system#
```

4.3.3 Help Show

Like the **help|? set** option discussed in the previous paragraph, entering **help|? show** at any subsystem prompt displays those commands, and the global commands, available in the present subsystem that use the command verb **show** as part of the command syntax. Use of this help option can save the user time in searching for the particular **show** command to perform a particular function.

```
246:ASN9000:system# ? show

Help available for:

default-device|dd [show]
baud set tty1|tty2 1200|2300|4800|9600|19200
baud [show]
bootinfo|bi [show]
date set [YYMMDD]hhmm[.ss]
date [show]
dcd-dection|dcd enable|disable
dcd-detection|dcd [show]
idprom|idp [show] <slot number>|all
promver|pv [show]
syslocn set <location>
syslocn [show] <location>
sysname set <location>
sysname [show] <location>
temperature|temp [show] <slot number>|all
uptime [show]
version|ver [show] [<slot-number>|all]
config [show]
```

```
You may obtain more detailed help by giving additional parameters

247:ASN9000:system#
```

CHAPTER 5 Global Commands

This chapter discusses the use of global commands that are available within the ASN-9000 run-time software from any system prompt. Global commands are those commands which can be executed from any subsystem in the ASN-9000.

5.1 Accessing Global Commands

Entering **`global help`** at any system prompt displays the global commands. The following display shows the global commands:

```
4:ASN-9000:system# global help

global subsystem:

        alias                                   rcprompt
        checksum                                readenv|rdenv
        copy|cp                                 rename|mv
        default-device|dd                       rm
        dir                                     saveenv|svenv
        format|fmt                              show-config-example|shex
        help|?                                  stty
        history|hi                              su
        histchars                               subsystems|ss
        logout|bye                              timedcmd|tc
        ls                                      type|cat
        pnm                                     unalias

5:ASN-9000:system#
```

The following paragraphs describe the function performed by each global command and the syntax required.

5.1.1 Alias

The **`alias`** command is used to create a shortened version of a command. The syntax for this command is as follows:

`alias [<name> [<command>]]`

where

[<name> Specifies a name for the specified command. If no command is specified, the alias command displays the command assigned to that alias. If no name is specified, all defined aliases are displayed.

[<command>]] Specifies a command to be executed whenever the specified alias is entered at a command prompt.

Aliases can be removed by using the **unalias** command (Section 5.1.23) when logging out of the current session (**logout|bye**) (Section 5.1.10) or rebooting the system. Aliases can not be saved with the **system savecfg|svcfg** command (refer to Chapter 6) but can be saved using the global **saveenv|svenv** command (see Section 5.1.13).

The following example defines the alias **ia,** which replaces the **interface add** command, whenever entered. The alias shown is used to add an ip interface on vlan test using ip address 144.132.55.65.

```
43:ASN-9000:system# alias ia interface add
Added ia:  interface add
44:ASN-9000:system# ip ia test 144.132.55.65
Vlan test, Addr 144.132.55.65, Subnet mask 255.255.0.0,  type bcast Added
45:ASN-9000:system#
```

5.1.2 Checksum

The **checksum|sum** command is used to calculate the checksum of files on the default or specified device. Calculating the checksum of all files when they are initially loaded and comparing this information, should problems start to occur, could point to possible corruption of the source file(s). Replacing the file(s) with clean copies may correct the problem. For each new code release, FORE Systems TACtics Online distributes checksum information against which you will be able to verify the validity of the code by using the **checksum** command . Each patch release has a corresponding patch release note which identifies each fix delta incorporated as well as the checksum values for the operational code modules (eg. 7pe, 7atm, 7feth, 7fdd).

The syntax for the **checksum|sum** command is:

checksum|sum [<device>] <filename>

where

[<device>] The default-device is used unless a device is specified. Specify **fd:** for the floppy diskette or **fm:** for the Flash Memory Module.

<filename> Specify the name of a file on the device to calculate the checksum of the file.

The following example displays the checksum value of the Packet Engine runtime software image (**pe1**) located on the default-device, i.e. the Flash Memory Module (**fm:**).

```
24:ASN-9000:system# checksum pe1

0x425367b2 FM:-PE1

25:ASN-9000:system#
```

5.1.3 Copy

The **copy|cp** command is used to copy files from one device to another or to make additional copies of files on the default device or specified device. The syntax of this command is as follows:

copy|cp [default-device|<device>]<file1> <file2>

where

[default-device|<device>] Specifies the source device: **fd** or **fm**. If no device is specified the default-device is assumed.

<file1> Specifies the source filename.

<file2> Specifies the destination filename.

The following example copies the default configuration file (**cfg**) from the Flash Memory Module (default-device) to the floppy disk (**fd:**) renaming the file to **cfg1**.

```
39:ASN-9000:system# copy cfg fd:cfg1
copy: copying 'cfg' to 'fd:cfg1'
40:ASN-9000:system#
```

5.1.4 Default-Device

The **default-device|dd** command is used to set the default device for file operations within the current session. Subsequent file names that do not include a device name are automatically referred to this device. The syntax for this command is as follows:

default-device|dd set <device>

where

<device> The specified device can be **fd** for the floppy diskette or **fm** for the Flash Memory Module.

The following example sets the default-device to the floppy diskette (**fd**).

```
43:ASN-9000:system# dd set fd
default device set to FD:
44:ASN-9000:system#
```

5.1.5 Directory

The **dir|ls** commands are used to display a listing of the contents of the files on the default or a specified device. These commands present a DOS or UNIX like listing of the contents of the files. The syntax for this command is as follows:

ls|dir [default-device|<device>] [<filespec>]

where

[default-device|<device>] Specifies a device if the default-device is not the device being queried. The device can be **fd** or **fm**.

[<filespec>] Specifies the files to display. The asterisk **(*)** wild card can be used to display all files of a particular type.

The following example displays the directory contents of the default-device, Flash Memory Module.

```
1:ASN-9000:system# dir

 Volume in device is 4MB FLASH
ATM-PE1 598747 5-08-1998 9:36a
PPU-PE1 58365   5-13-1998 1:05p
PE1P     PRM 588918 5-13-1998 1:05p
EXPERT  0       5-13-1998 1:09p
BOOTDEF  PE1 28 5-08-1998 9:33a
PE1     1446688 5-08-1998 9:35a
BOOTDEF  PPU 36 5-13-1998 1:04p
GFC     36779   5-15-1998 11:06a
CFG     34950   5-19-1998 12:57p
MREBOOT  LOG 0 5-21-19981:31p
12 File(s)    1069568 bytes free

2:ASN-9000:system# ls
```

```
598747  5-08-19989:36a FM:ATM-PE1
28      5-08-19989:33  FM:BOOTDEF.PE1
36      5-13-19981:04p FM:BOOTDEF.PPU
34950   5-19-199812:57pFM:CFG
0       5-13-19981:09p FM:EXPERT

6779    5-15-199811:06a FM:GFC
0       5-21-19981:31p FM:MREBOOT.LOG
1446688 5-08-1998   9:35aFM:PE1
588918  5-13-1998   1:05pFM:PE1P.PRM
58365   5-13-19981:05p FM:PPU-PE1
```

5.1.6 Format

CAUTION

Use extreme care when executing this command. This command removes **all** files from the specified device. Ensure that any configuration (**`cfg`**) files have been saved to floppy disk (**`copy cfg fd:cfg`**) or transferred to a configured tftp boot server and that access to the run-time software is available from floppy diskette .

The **`format|fmt`** command can be used to format the Flash Memory Module (**`fm:`**) of the ASN-9000. The syntax for this command is as follows:

`format|fmt <device>`

where

<device> Specify **fm:** (Flash Memory Module).

The following example formats the Flash Memory Module.

```
63:ASN-9000:system# format fm:
WARNING: Formatting will erase all data from the device.
Are you sure you want to continue? y
Erasing ..........................................................
Format complete
Restarting FlashFileSystem
Restarting FlashFileSystem complete
64:ASN-9000:system#
```

5.1.7 Help

The **help|?** command is used to display the commands in the current, or specified, subsystem as well as syntax help for a specified command. Refer to Chapter 4 for detailed information on On-Line Help. The syntax for this command is as follows:

help|? <word> [<word> ...]

where

<word> Specifies a command for which to obtain help. If no <word> is specified, a listing of the available commands is displayed.

[<word> ...] Specifies additional words that are normally used in conjunction with the first word specified, e.g., **interface add**.

The following example displays the help information for the **ip interface add** command. Notice that this command was executed from within the system subsystem and that the help command (**?**) was entered after specifying the ip subsystem.

```
17:ASN-9000:system# ip ? interface add

it|interface add <vlanid> <ipaddr>[/<prefixlen>|<mask>]
       [ ift[ype] b[c] | n[bma] | [p[top] <nbr_addr>] ]

       Add an IP interface to the given vlan. If <mask> is not specified
       then "natural" subnet mask (class A, B, or C address mask) for the
       IP address is used. Interface type can be one of broadcast, nbma
       and ptop. Neighbor address must be specified only for ptop type.
       If interface type is not specified, broadcast is assumed by default.

18:ASN-9000:system#
```

5.1.8 History

The **history|hi** command is used to display a history of the last 21 commands executed during the current session. The syntax for this command is as follows:

history|hi

The following example displays the last 6 commands executed. The line numbers on the left indicate the commands in the order they were entered. Using this display, it is possible to reenter a command by entering an exclamation mark followed by the command line number. In this example, entering (**!3**) will re-execute the **stty** command. The last command can also be re-entered with a double exclamation mark (**!!**).

```
6:ASN-9000:system# hi
1 ver
2 idp
3 stty
4 ?
5 baud
6 hi
7:ASN-9000:system#
```

5.1.9 History Characters

The **histchars** command can be used to display the current history characters or set different history characters. The syntax for this command is as follows:

histchars [<ch1>[<ch2>]]

The following example displays the current (default) history characters.

```
9:ASN-9000:system# histchars
history sub: !         quick sub: ^
10:ASN-9000:system#
```

For each session, a history of the 32 most recently issued commands is maintained. The history commands can be used to display, to reissue, or edit and reissue commands. To reissue or edit commands listed in the command history, use the history control characters. The default history control characters are:

! History-prefix character.

^ Quick-substitution character.

The history control characters can be used to form commands to be reissued (or modified and reissued) from the command history. The history commands used to edit and reissue commands listed in the command history are discussed below. The syntax is shown using the default history characters.

!! Repeats the previous command.

!<n> Repeats a command listed in the command history, where <**n**> indicates the number of the command as listed in the history display.

!<-i> Issues a previously issued command, where <**i**> is the offset back from the current command. For example, the command `!-1` gives the same results as `!!`, which reissues the previous command.

!<substring> Repeats a previous command that begins with the string identified by <**substring**>.

^<old>^<new> Modifies then reissues the previous command. <**old**> indicates the string to be replaced with <**new**>.

5.1.10 Logout

The **bye|logout** command is used to log out of the current session. If the lock switch, located on the front panel of the Packet Engine is set to Lock (refer to the ForeRunner ASN-9000 *Hardware Reference Manual* for detailed information on setting / changing the Lock Switch and / or Lock Switch Jumpers), the interface displays the `login:` prompt and the next session requires the user to login at either the root or monitor level and to enter the appropriate password to gain access. Additionally, the command line counter is reset to 1.The syntax for this command is:

bye|logout

The following example shows the use of the **logout** command.

```
18:ASN-9000:system# logout
```

5.1.11 Port Number Mode

The **pnm** command is used to change the way port numbers are entered and displayed. The syntax for this command is as follows:

pnm set multi|old
pnm [show]

where

multi|old Specifies to set either the multi-part (<*slot*>.<*seg*>) or the old-style (*vport*) port numbering scheme.

The following examples show the results of using the **pnm** command. First the current state is displayed, followed by a display of a configured vlan. The the port numbering mode is set to the old style and the same vlan is displayed. Notice that the Segment List field in the first vlan display shows the segment as <*slot*>.<*port*> and in the second vlan display the Segment List displays the virtual port. The multi-part numbering uses the physical segments on the installed cards, counting from the card in slot 1 up to the last segment on the last card installed in the system. The virtual port (<*vport*>) numbering system consecutively numbers each segment available in the system. Using the multi-mode scheme, the vlan shown is on the first segment of the card in slot 2.

```
12:ASN-9000:ip# pnm
pnm:    multi
13:ASN-9000:ip# vlan
VLAN            State Segment List
--------------- ----- ------------
techpubs        up    2.1

VLAN Count: 1
14:ASN-9000:ip# pnm set old
15:ASN-9000:ip# vlan
VLAN            State Segment List
--------------- ----- ------------
techpubs        up    33

VLAN Count: 1
16:ASN-9000:ip#
```

5.1.12 Return Code Prompt

The **rcprompt** command is used to enable or disable printing of command return codes for commands executed automatically from a script. This feature is intended primarily for automated interactions with the command-line interface. The syntax for this command is as follows:

rcprompt enable|disable

where

enable|disable Enables or disables printing of command-return codes in the next UI prompt. Return codes are displayed with **0** for successfully executed commands and with **F** for unsuccessful commands.

The following example enables the return code prompt and displays the results.

```
33:ASN-9000:system# rcprompt enable
00000000:34:ASN-9000:system# hi
35 ip
36 it
37 vlan
36 pnm set multi
37 hi
00000000:38:ASN-9000:system#
```

5.1.13 Read Environment

The **readenv|rdenv** command is used to execute the file environment <*file*> in the context of the current UI session. The syntax for this command is:

readenv|rdenv [default-device|<device>]<file>

where

[default-device|<device>] Specifies the device to read the environment file from: **fd** or **fm**. If no device is specified, the environment file is read from the default device.

<file> Specifies an environment file stored on the specified device. The default is no device specified.

The following example reads environment file *myenv* from the default device.

```
57:ASN-9000:system# rdenv myenv
nui

#
# stty
#
stty rows 24
stty -more

#
# aliases
#

#
# timed commands
#
58:ASN-9000:system#
```

5.1.14 Rename

The **mv|rename** command is used to rename files located on either a specified device or the default-device. The syntax for this command is as follows:

rename|mv [default-device|<device>]<file1> <file2>

where

[default-device|<device>] Specifies the device the source or destination file is located on: **fd** or **fm**. If no device is specified, the source file is assumed to be on the default-device.

<file1> Specifies the filename of the file to be renamed.

<file2> Specifies the new filename to be applied to the file.

5.1.15 Remove

The **rm** command deletes files from the default-device or a specified device. The syntax for this command is as follows:

```
rm [-i] [-f] [default-device|<device>]<filespec>
```

where

[-i]	Overrides the **-f** flag, presenting a prompt before removing each file. The prompt provides an opportunity to cancel the request to remove the file. If **-f** or **-i** is not specified, **-i** is the default.
[-f]	Specifies forced deletion. Delete without confirmation.
[default-device|<device>]	Specifies the device the source file is located on: **fd** or **fm**. If no device is specified, the source file is assumed to be on the default-device.
<filespec>	Specifies the file, or files, to be deleted from the default-device or specified device. Use of the asterisk (*****) is allowed.

5.1.16 Save Environment

The **saveenv|svenv** command saves the current system environment to the default-device or specified device. The syntax for this command is as follows:

```
saveenv|svenv [default-device|<device>]<file>
```

where

[default-device|<device>]	Specifies the device the environment file is being saved to: **fd** or **fm**. If no device is specified, the file is saved on the default-device.
<file>	Specifies the name of the environment file to be saved.

5.1.17 Show Configuration Example

The **show-config-example|shex** command displays to the user console examples of typical configurations. There are no arguments or options for this command. The syntax for this command is as follows:

show-config-example|shex

```
169:ASN-9000:ip/rip# shex

The following shows a short example to configure ip interface

       ip vlan add 200.200.200.200 2.1   (add a vlan on segment 2.1)
       ip it add 200.200.200.200 200.200.200.200  (add an ip interface)
       ip enable   (enable ip forwarding)

The following shows some commands in subsystem "bridge"

       bridge br penable  2.1   ("port" enable bridging on seg. 2.1)
       bridge br pdisable 2.2   ("port" disable bridging on seg. 2.2)
       bridge st enable   (enable spanning tree)
       bridge st disable  (enable spanning tree)

In summary, there may be "enable/disable" and their derives
such as "penable/pdisable", "senable/sdisable", and etc.
to set a particular feature on and off
Use "help [cnps]enable" and "help [cnps]disable" in each
subsystem to see what can be set on/off.

170:ASN-9000:ip/rip#
```

5.1.18 Set TTY

The **stty** command is used to set or display tty parameters. The syntax for this command is:

stty [-d[efault]] [-t <tty>] [rows <#>] [-|[+]more]
[-|[+]dcd] [<speed>] [erase <c>] [kill <c>] [werase <c>]
[intr <c>] [rprnt <c>] [stop <c>] [start <c>]

where	
-default	Sets <speed> in NVRAM for the tty port.
-t <tty>	Specifies the tty port to apply the baud rate change. Used with the -default option.
rows <number>	Specifies the number of rows to display on the terminal.
[+]more	Enable paging of long displays.
-more	Disable paging of long displays.
[+]dcd	Enable dcd-detection.
-dcd	Disable dcd-detection.

tabs	Output tabs unchanged.
-tabs	Expand tabs to spaces on output.
<speed>	Specifies the baud rate to be used for tty. Used with default and -t options.

NOTE: Specifying -default also causes the speed change to occur in NVRAM. If -default is not specified, then the speed change affects the tty.

erase <c>	Sets erase character for telnet sessions.
kill <c>	Sets line erase for telnet sessions.
werase <c>	Sets word erase for telnet sessions.
intr <c>	Sets interrupt character for telnet sessions.
rprnt <c>	Sets reprint line for telnet sessions.
stop <c>	Sets xoff flow control for telnet sessions.
start <c>	Sets xon flow control for telnet sessions.

The following example sets the baud rate of tty1 to the default of 9600 baud and the baud rate of tty2 to 4800 baud. This is followed by a display of the current tty settings.

```
7:ASN-9000:system# stty -default -t tty2 4800
8:ASN-9000:system# stty
TTY        Current Baud Rate        NVRAM Baud Rate
1               9600                    9600
2               -----                   4800

rows: 24
more: disabled

dcd-detection is currently disabled.
9:ASN-9000:system#
```


5.1.19 Set User

The **su** command can be used to nest access levels within the current session from root to monitor. The syntax for this command is as follows:

su [root|monitor]

where

[root|monitor] Changes the access level of the current session to either a `root` or `monitor` session. If the current session is `root`, the only available option is `monitor`, and vice versa. Entering `logout` returns the session to the root access level. When nested in a `monitor` session, the user has no root privileges. The default is `root`.

The following example switches the current user session from `root` to `monitor`. An attempt is then made to change the session back to `root`. An error message is presented. Then the monitor session is exited by entering `logout`.

```
1:ASN-9000:system# su monitor
Ok
2:ASN-9000:system> su root
Cannot nest 'su' commands: use 'logout' to end sub-session.
3:ASN-9000:system> logout
4:ASN-9000:system#
```

5.1.20 Subsystems

The **`subsystems|ss`** command displays a list of available subsystems to the console. The syntax for this command is:

`subsystems|ss`

The following example displays the results of entering the **`ss`** command.

```
4:ASN-9000:system# ss
atalk atm atm/1483bridged atm/1483routed atm/clip atm/clippvc atm/foreip atm/lan
e atm/mps atm/nhs atm/mpc bridge dec host ip ip/rip ip/ospf ip/mcast ipx ip
x/rip ipx/sap media nvram snmp system tftp telnet
5:ASN-9000:system#
```

5.1.21 Timed Command

The **`timedcmd|tc`** command is used to define a timed command. Timed commands can be defined to automatically issue any command string at regular intervals. A timed command is similar to an alias (see Section 5.1.1 for more information on defining an alias), except that it is automatically executed at a specific interval. Commands and aliases can be defined as timed commands. Each user session can contain up to eight timed commands. As with aliases, timed commands are local to the current session. Timed commands can be saved in environment files (see Section 5.1.16 for more information on saving environment files). If no argument is

specified, a display of all defined timed commands is presented. The syntax for this command is as follows:

timedcmd|tc add <id> <time> <cmd>
timedcmd|tc del[ete] <id>
timedcmd|tc enl[enable] <id>
timedcmd|tc dis[able] <id>

where

add	Associates <cmd> with <id> and interval <time>. If <id> specifies a running timed command, it remains running, but if <id> specifies an idle timed command, it remains idle.
del[ete]	Delete timed command <id>.
enl[enable]	Enable timed command <id>, that is, start it running.
dis[able]	Disable timed command <id>, that is, stop it from running.

The following example creates a timed command to display the configured elans every 10 seconds. The timed command is then enabled and, following the display, deleted.

```
38:ASN-9000:system# timedcmd add elansh 10 atm/lane elan all
Added elansh: 10 secs, atm/lane elan all (timer not running)
39:ASN-9000:system# timedcmd enl elansh
elansh: started at 10 seconds interval
40:ASN-9000:system#
Segment  Elan Name             Sel Byte        Mode      State
--------------------------------------------------------------------------
1.1     -auto                0x00           Auto      Down
40:ASN-9000:system# timedcmd del elansh
elansh: stopped and deleted
41:ASN-9000:system#
```

5.1.22 Type

The **type|cat** command can be used to display a file located on the default-device or a specified device to the console. This command works similarly to the UNIX cat or DOS type commands. The syntax for this command is as follows:

cat|type [default-device|<device>]<filename>

where

[default-device|<device>]	Specifies the device on which the file to be displayed is located on: **fd** or **fm**. If no device is specified, the file is assumed to be on the default-device.
<filename>	Specifies the name of the file to be displayed.

5.1.23 Unalias

The **unalias** command removes a previously defined alias definition (see Section 5.1.1). The syntax for this command is as follows:

```
unalias <name>
```

where

<name>	Specifies the alias definition to be removed.

CHAPTER 6 System Commands

This chapter describes the commands in the `system` subsystem. These commands are used to display or control various system-level settings or conditions. The commands available within the `system` subsystem are:

```
51:ASN-9000:system# ?

system subsystem:

baud                                passwd
bootinfo|bi                         readcfg|rdcfg
card-swap|cs                        reboot
config                              savecfg|svcfg
convert-config|ccfg                 syslocn
date                                sysname
dcd-detection|dcd                   temperature|temp
ethaddr|ea                          tty2
idprom|idp                          uptime
mem                                 version|ver

type 'global help' for global commands

type 'shex' to show an example of configuration

2:ASN-9000:system#
```

6.1 Accessing the System Subsystem

The `system` subsystem is the default subsystem entered when the ASN-9000 completes the boot process. To access the `system` subsystem from any other subsystem, enter **`system`** from the current runtime prompt.

6.1.1 Baud

The **`baud`** command is used to set or display the baud rate on either the TTY1 or TTY2 RS-232 port. However, before setting the baud rate associated with TTY2, the port must be enabled using the **`tty2`** command (see Section 6.1.18). The syntax for this command is as follows:

`baud set tty1|tty2 1200|2300|4800|9600|19200`
`baud [show]`

where

set	Specifies that the baud rate is to be set. Sets the specified baud rate for the specified port.
tty1|tty2	Specifies the port to be set.
1200|2300|4800|9600|19200	Specify the desired baud rate to be applied to the specified port.

The newly specified rate is stored in non-volatile random access memory (NVRAM) and takes effect immediately. It is retained across logins and power cycles. The following examples display the current baud rate selections, then TTY2 is enabled and the baud rate is set to 9600.

```
43:ASN-9000:system# baud
TTY        Baud Rate
1         9600
2         19200
44:ASN-9000:system# tty2 enable
45:ASN-9000:system# baud set tty2 9600
Changed tty2 baud rate to 9600; written to nvram
46:ASN-9000:system#
```

If the Lock Switch is unlocked when booting the system, the TTY ports use the default baud rates (9600 for TTY1 and 1200 for TTY2), regardless of the baud rates stored in NVRAM.

6.1.2 Bootinfo

The **bootinfo|bi** command is used to display the contents of the boot log. The syntax for this command is as follows:

bootinfo|bi [show]

After the system run-time software is loaded, the following information is logged in memory as the boot log.:

- The date and time the system was started.
- The date, time and nvram bootorder (see Chapter 8 on setting the nvram boot order).
- The boot device used to boot. The value can be f (floppy diskette) or m (Flash Memory Module). This value shows the boot source actually used, which may differ from the boot order specified in NVRAM.

The following example displays the boot log.

```
7:ASN-9000:system# bootinfo
Thu Feb 26 15:18:08 1998 start
Thu Feb 26 15:18:17 1998 nvram boot order: fm
boot device: m
8:ASN-9000:system#
```


6.1.3 Card Swap

The **card-swap|cs** command is used whenever it is necessary to remove and re-install a NIM so that the configuration manager can deactivate traffic to ports / segments on that NIM. These operations can be accomplished while the system is operating if the module being installed matches exactly the module that was removed. Refer to the *ForeRunner ASN-9000 Hardware Reference Manual* for detailed procedures on removing and replacing NIMs.

NIMs can only be swapped when the chassis contains at least one redundant power module. Refer to the *ForeRunner ASN-9000 Hardware Reference Manual* for information about power redundancy. The **card-swap** command is only to be used with Network Interface Modules (NIMs).

NOTE

The NIM being installed must be of the same type as the one removed. If the replacement NIM is of a different type than the one that was removed, it will be necessary to power down the system, remove the card, insert the new card and then power on the system. This sequence loads the ID PROM information of the cards currently installed into the configuration manager.

The syntax for this command is as follows:

`card-swap|cs enable|disable <slot>`
`card-swap|cs [show]`

where

enable|disable Specifies whether to enable, i.e. insert, or disable, i.e. remove, a module. Enable states that the card is restored to the system.

<slot> Specifies which slot is being enabled / disabled.

The following example shows the result of executing the **`card-swap|cs`** command with no options.

```
4:ASN-9000:system# cs
Slot           Status
       1:      Actively in service.
       2:      Actively in service.
       3:      Not present during boot!
       4:      Actively in service.
       5:      <<< Packet Engine CPU >>>
       6:      Not present during boot!
       7:      Not present during boot!
       8:      Not present during boot!
       9:      Not present during boot!
       10:     Not present during boot!
5:ASN-9000:system#
```

The following example removes the ATM PowerCell module in slot 1. This is followed by installing the ATM PowerCell module back to slot 1. Notice that following the execution of the **`enable`** command, the appropriate runtime module is reloaded to the new module.

```
84:ASN-9000:system# cs disable 1
Card 1 removed.
85:ASN-9000:system# cs enable 1

GINIM BOOTCard 1 inserted.
: slot 1, image "FM:atm pe1"
86:ASN-9000:system#
```

6.1.4 Config

The **config** command is used to display the current system configuration. This command displays information pertaining to the physical configuration of the system. There are no options or arguments to this command. The following example displays the system information for an ASN-9000.

```
3:ASN-9000:system# config
Accelerator board is present. Accelerator IOP is being used.
Installed DRAM Size: 24 MB
tty1:  9600 baud
tty2:  4800 baud
PE:    slot 5
PM1:   present and good
PM2:   not present
PM3:   not present
PM4:   not present
  01/01 OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF
        OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF
        OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF
        OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF
        OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF  OC3-MF
        OC3-MF  OC3-MF
4:ASN-9000:system#
```

The following information is displayed:

- Whether or not a Packet Accelerator is present on the Packet Engine and if the accelerator input/output processor (IOP) is in use or not.
- The amount of dynamic random access memory (DRAM) installed on the Packet Engine.
- The current baud rates assigned to the TTY1/TTY2 ports.
- The slot occupied by the Packet Engine, indicated by PE. In this example, the Packet Engine is in slot 5, the top slot in a 5-slot chassis.
- The presence and status of power modules, indicated by PM1, PM2, PM3, and PM4.

- The slot number and starting segment number of the modules in each slot, and the media type in use in each segment position. The row beginning 01/01 displays the configuration of the module in slot 1, beginning with segment 1. Empty NIM slots are not displayed.

6.1.5 Convert Config

The **`convert-config|ccfg`** command is not applicable to the *ForeRunner* ASN-9000.

6.1.6 Date

The **`date`** command is used to display or set the system date and time. The syntax for this command is as follows:

```
date set [YYMMDD]hhmm[.ss]
     date [show]
```

where

set Sets the specified date and / or time.

[YYMMDD]hhmm>[.ss] Specifies the year (*YY*), month (*MM*), day (*DD*), hour (*hh*), minute (*mm*), and, optionally, the seconds [.*ss*]. To set the time, but not the date, specify <*hhmm*>**[.**<*ss*>**]**. If the seconds argument is used, make sure to use the period (**.**) in front of the seconds. If the number of seconds is not specified, the value is set to 00. (The software reads this argument from right to left, so any additional arguments can be specified with <*hhmm*>. For example, specifying <*DDhhmm*> also specifies the day. Note that the arguments must be specified in the order shown. For example, <*YYhhmm*> or <*DDMMYYhhmm*> cannot be entered.) If no arguments are specified, the current date and time is displayed.

The following examples show the command to display the current system date and time, the command to set a new system date and time, and the command to re-display the time set for verification.

```
117:ASN-9000:system# date
Thu Feb 26 13:35:08 1998
118:ASN-9000:system# date set 9802261436.30
date set to: Thu Feb 26 14:36:30 1998
119:ASN-9000:system# date
Thu Feb 26 14:36:33 1998
120:ASN-9000:system#
```

6.1.7 Data Carrier Detect

The **dcd-detection|dcd** command is used to enable or disable data-carrier detection. If entered with no arguments, the current state of data-carrier detection is displayed. The syntax for this command is as follows:

dcd-detection|dcd enable|disable
dcd-detection|dcd [show]

where

enable|disable Specifies whether to enable or disable data-carrier detection. If no argument is entered, the current state of data-carrier detection is displayed.

The following examples show a display of the current state of data-carrier detection, the disabling of data-carrier detection, and the re-enabling of data-carrier detection:

```
135:ASN-9000:system# dcd
dcd-detection is currently disabled.
136:ASN-9000:system# dcd disable
dcd-detection disabled
137:ASN-9000:system# dcd enable
dcd-detection enabled
138:ASN-9000:system#
```

6.1.8 Ethernet Address

The **ethaddr|ea** command is used to display the Ethernet Mac-layer address of theASN-9000. The syntax for this command is as follows:

ethaddr|ea [show]

The following example displays the Ethernet MAC-layer address.

```
141:ASN-9000:system# ethaddr
Ethernet address: 00-00-ef-03-9a-b0
142:ASN-9000:system#
```

6.1.9 ID Prom

The **idprom|idp** command is used to display the ID PROM information recorded during the last power on cycle. The Packet Engine and NIMs contain a special PROM called the ID PROM. The ID PROM contains identification information and power requirements for the respective module. The syntax for this command is:

idprom|idp [show] <slot number>|all

where

<slot number>|all Specifies the slot containing the module for which the ID PROM information is requested or all, displaying the ID PROM information for all installed modules.

The following example displays the results produced by this command. In this example, information is displayed for the module in slot 1, a PowerCell 700 module.

```
77:ASN-9000:system# idp 1

          Card Type: PowerCell 700 (ATM)
           Serial #: 633020637
              Model: 7401-00
           Revision: K
              Issue: 3
          Deviation: <not set>

   Power Requirements:
     8000 mA at 5V
     10 mA at 12V

78:ASN-9000:system#
```

The ID PROM display shows the following information:

Card Type: The module currently installed in the specified slot.

Serial #: The serial number of the module.

Model: The model number of the module.

Revision: The revision level of the module.

Issue: The module issue number.

Deviation: If applicable, the factory-assigned deviation number. Only some modules have deviation numbers.

Power Requirements: The maximum amperage (milliamps) required by the module at +12-volts, +5-volts, or +3.3-volts, as applicable.

Some older revisions of the Packet Engine and NIMs do not contain ID PROMs. If the **idprom** command is issued against such a module, or an empty card slot, the following message is displayed:

```
78:ASN-9000:system# idp 3
unable to read IDPROM information from slot 3
79:ASN-9000:system#
```

6.1.10 Memory

The **mem** command is used to display the amount of memory that is installed on an Intelligent Network Interface Module (INIM) or the Packet Engine. The Packet Engine memory can also be noted when booting the system. The syntax for this command is:

mem [show] <slot-number>

where

<slot-number> The slot being queried.

The following example displays the amount of memory installed on the INIM located in slot 1. The INIM in slot one is an ATM PowerCell module.

```
3:ASN-9000:system# mem 1
memory is 32MB
4:ASN-9000:system#
```

6.1.11 Password

The **passwd** command is used to change the system password associated with "root" or "monitor" logins. The syntax for this command is:

passwd [root|monitor]

where

root|monitor Indicates the management capability for which the password is being changed.

The steps to change a password are:

1. Issue the **passwd** command, specifying the appropriate management level (root or monitor) capability. A prompt is displayed to enter the new password.
2. Enter the new password to be assigned to this management level. If no password is to be set, press Enter.
3. A prompt is then presented to re-enter the password (`Re-enter new password:`) previously entered.

4. Re-enter the password that was entered at the `New password:` prompt, press Enter.

This prompt is not displayed if the Lock Switch is in the unlocked position (U) or the Lock Switch jumper is set to Unlock. Instead, the New password: prompt is displayed.

5. The message "`Password changed`" is displayed to confirm that the password was changed.

The following example changes the password for the monitor access level.

```
11:ASN-9000:system# passwd monitor
New password:*************
Re-enter new password:*************
Password changed
12:ASN-9000:system#
```

For security reasons, the input shown above with asterisks does not appear when entered in response to the prompts. Passwords are limited to 13-characters in length. Remember that passwords are not required if the Lock Switch is in the unlocked (U) position. If the password is forgotten, turn the Lock Switch off, log in and enter a new password, then turn the Lock Switch on again.

6.1.12 Read Configuration

The **`readcfg|rdcfg`** command is used to load a configuration file. Even if the system finds and loads a configuration file when the software is booted, additional configuration files can be loaded during a session using the **`readcfg`** command. The syntax for this command is as follows:

`readcfg|rdcfg [-v] [default-device|<device>]<file>`

where

[-v]	Optional argument that displays each command in the configuration file to the user console as it is read.
[default-device|<device>]	Specifies the device where the configuration file is stored: fd or fm. If no device is specified, the default-device is assumed.
<file>	Specifies the name of the configuration file to be read.

NOTE

The new configuration information does not undo the configuration information contained in the default **cfg** file. Instead, the new configuration is added to the current configuration until the system is powered down or rebooted. The additional configuration information can be saved with the current configuration information by issuing the **savecfg** command (see Section 6.1.14).

6.1.13 Reboot

The **reboot** command is used to manually reboot theASN-9000. The **reboot** command performs a cold restart of theASN-9000. During a cold restart, the Packet Engine conducts a power-on self-test to check its various hardware components. Following successful completion of the power-on self-tests the system software is loaded. The syntax for this command is as follows:

```
reboot
```

6.1.14 Save Configuration

The **savecfg|svcfg** command is used to save the current configuration to a file on a specified device. The default filename for this file is `cfg`, but any filename can be used. If configuration changes are saved to a file other than `cfg`, the file must be loaded after the software is loaded using the **readcfg|rdcfg** command (see Section 6.1.12). The syntax for this command is:

```
savecfg|svcfg <file or device name>
```

where

<file or device name> Specifies the name under which the configuration file is to be saved.

The following example saves the current configuration changes to the default file cfg on the default-device.

```
17:ASN-9000:system# savecfg cfg
overwrite cfg? y
18:ASN-9000:system#
```

6.1.15 System Location

The **syslocn** command is used to optionally identify a particularASN-9000. The system location can be used by a Simple Network Management Protocol (SNMP) management station to identify this particular system. The syntax for this command is:

```
syslocn set <location>
syslocn [show] <location>
```

where

set Sets the specified location.

<location> Specifies the location of the ASN-9000. Any alphanumeric string up to 24 characters in length can be specified. The location name cannot contain spaces. If a location is not specified, the location name of the current system issuing the command is displayed.

The following example shows the current system location, "Undefined," and changes the location variable to "TechPubs."

```
19:ASN-9000:system# syslocn
Current system location is: Undefined

20:ASN-9000:system# syslocn set TechPubs
System location set to:
TechPubs
21:ASN-9000:system#
```

6.1.16 System Name

The **sysname** command can be used to change the displayed ASN-9000 system command prompt. The default system name is ASN-9000. The syntax for this command is:

```
sysname set <sysname>
sysname [show] <sysname>
```

where

set Sets the name specified.

<sysname> Specifies a name to be assigned to this ASN-9000. Any alphanumeric string up to 24 characters in length can be specified. The name cannot contain spaces. If a name is not specified, the current system name is displayed.

The following example shows how to display the current system name and to change the name variable. The new system name is defined as "PHswitch."

```
22:ASN-9000:system# sysname
Current system name is: ASN-9000
23:ASN-9000:system# sysname set ASN
System name set to 'ASN'.
24:ASN:system#
```

6.1.17 Temperature

The **temperature|temp** command is used to read the temperature sensor on board each module. Each module type contains an on board temperature sensor that reads the temperature of the module with an accuracy of plus or minus 0.5° C. The syntax of this command is:

temperature|temp [show] <slot number>|all

where

<slot number> Specifies the slot for which to display the temperature.

all Displays the temperature for all installed modules.

In the following examples, the temperature of all installed modules is displayed followed by the temperature of the module currently installed in slot 1.

```
4:ASN-9000:system# temperature all
slot  5, temp  44 degrees C
slot  4, temp  39 degrees C
slot  2, temp  34.5 degrees C
slot  1, temp  34.5 degrees C
5:ASN-9000:system# temp 1
slot  1, temp  34.5 degrees C
6:ASN-9000:system#
```

Note that the ASN-9000 is designed to operate over a range of external ambient temperatures. An additional temperature rise inside the chassis is taken into account in the design of the product.

Some older revisions of the Packet Engine and NIMs do not contain an ID PROM. If the **temperature** command is issued against a module that does not contain an ID PROM or against a slot that does not contain a NIM, the system displays the following message:

```
6:ASN-9000:system# temp 3
slot  3, temp not available
7:ASN-9000:system#
```

6.1.18 TTY2

The **tty2** command is used to enable or disable the TTY2 port, located on the Packet Engine. The TTY2 port must be enabled before setting or changing the associated baud rate with the **baud** command (see Section 6.1.1). The syntax for this command is as follows:

tty2 enable|disable

where

enable|disable	Enables or disables the tty2 port.

In the following examples, an attempt is made to change the baud rate of the TTY2 port to 9600 baud. An error is displayed. The TTY2 port is then enabled and another attempt is made to change the baud setting. This results in a message displaying that the baud rate was changed and written to nvram. The TTY2 port is then disabled. A message is displayed indicating that the TTY2 port is now closed.

```
13:ASN-9000:system# baud set tty2 9600
Failed to change tty2 baud rate to 9600
14:ASN-9000:system# tty2 enable
15:ASN-9000:system# baud set tty2 9600
Changed tty2 baud rate to 9600; written to nvram
16:ASN-9000:system# tty2 disable
tty2 is now closed
17:ASN-9000:system#
```

If the Lock Switch is unlocked when booting, the TTY ports use the default baud rates (9600 for TTY1 and 1200 for TTY2), regardless of the baud rates stored in NVRAM.

6.1.19 Uptime

The **uptime** command is used to display how much time has elapsed since the last time the software was loaded. There are no parameters for the **uptime** command. The syntax for this command is as follows:

uptime [show]

The following example shows that the system has been up for 15 hours, 8 minutes and 52 seconds.

```
19:ASN-9000:system# uptime
Elapsed time since last reboot: 15 hours, 8 minutes, 52 seconds
20:ASN-9000:system#
```

6.1.20 Version

The **version|ver** command displays the version level of software currently running on the installed modules. The syntax of this command is as follows:

version|ver [show] [<slot-number>|all]

where

<slot-number> Lists the version of software on the card in the slot specified.

all Lists the version of software on the Packet Engine and all installed Intelligent NIMs. If no parameter is specified, version information for the Packet Engine firmware is displayed.

The following examples show typical displays of the use of this command.

```
21:ASN-9000:system# ver

         Card Type: Packet Engine - 40MHz
          Serial #: 633020265
             Model: 7101-01
          Revision: C
             Issue: 2
         Deviation: <not set>

ASN-9000 Version: ASN p1e FT_5.0.0 @6933 1998.02.18 09:20
PROM Version: pe1p-3.0.0 (7887) 1998.05.06 13:01
00000000:12:ASN-9000:system# ver 1

         Card Type: PowerCell 700 (ATM)
          Serial #: 633020637
             Model: 7401-00
          Revision: K
             Issue: 3
         Deviation: <not set>

 Runtime Version: ASN-9000-FT_5.0.0 atm-pe1 (7973) 1998.05.07 11:26
```

```
    Prom Version: ASN-9000-7atmp-1.3 (s1.8) 1998.03.10 11:39

00000000:13:ASN-9000:system# ver all
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############## Slot 5 ##############

         Card Type: Packet Engine - 40MHz
          Serial #: 633020265
             Model: 7101-01
          Revision: C
             Issue: 2
         Deviation: <not set>

ASN Version: ASN-9000_FT_5.0.0 pe1 (7973) 1998.05.07 11:19
    PROM Version: ASN-9000-pe1p-3.0.0 (7887) 1998.05.06 13:01



############## Slot 1 ##############

         Card Type: PowerCell 700 (ATM)
          Serial #: 633020637
             Model: 7401-00
          Revision: K
             Issue: 3
         Deviation: <not set>

 Runtime Version: ASN-9000-FT_5.0.0 atm-pe1 (7973) 1998.05.07 11:26
    Prom Version: ASN-9000-7atmp-1.3 (s1.8) 1998.03.10 11:39
```

The information provided in the **ver** command contains:

Card Type: The module currently installed in the slot.

Serial #: The serial number of the module.

Model: The model number of the module.

Revision: The revision level of the module.

Issue: The module issue number.

Deviation: If applicable, displays the factory-assigned deviation number. Only some modules have deviation numbers.

Version: Displays the installed software version, with the software build number, date and time.

PROM Version: Displays the installed PROM version information, which includes the version number with build date and time.

CHAPTER 7 Media Commands

This chapter describes the `media` subsystem commands. The `media` subsystem commands relate to the physical media and bridging configuration information. The commands within the `media` subsystem are:

```
24:ASN-9000:media# help

media subsystem:

config                                  segment
isstats                                 segmentname|segname|name
ledmode|lm                              ssd
monitor                                 ssdthreshold|ssdt
operating-mode|om                       status
portreceive|pr                          stats
portstats

25:ASN-9000:media#
```

7.1 Displaying Bridge-Related Configuration

The **config** command is used to display the current port and segment configuration and displays bridge-related information. The syntax of this command is as follows:

config [show] [<params>] [<disp-restrictors>]

where

<params> Specifies a comma separated list of parameters, where;

monitorDisplays whether port monitoring is enabled or disabled on the specified segment or segment list.

segmentDisplays whether forwarding is enabled or disabled on the specified segment or segment list.

[port]receiveDisplays whether the UTP port receivers are enabled or disabled. All available ports are displayed whether a segment is specified or not.

ssdDisplays the status of automatic segment state detection on the specified segment, or command-separated list of segments.

[segment]namesDisplays the segment names for the specified segment or command-separated list of segments. If no segment is specified, the segment names for all available segments are displayed.

portstatsDisplays whether port statistics are enabled or disabled.

isstatsDisplays whether inter-segment statistics collection is enabled or disabled.

<disp-restrictors> The display restrictors is limited to a segment or a comma separated list of segments.

The following example displays **the bridge-related configuration information for port 2.1.**

```
48:ASN-9000:media# config 2.1

Port Monitoring
---------------
Packets...
not being monitored on segment 2.1
```

```
Forwarding status of segments
-----------------------------
2.1 :enabled

UTP port receiver enable/disable status
---------------------------------------
Slot  4:  .
Slot  2:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Slot  1:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
.  .  .  .  .  .  .  .

Automatic segment state detection
---------------------------------
Segment  2.1 : enabled (currently good)

Segment names
-------------
2.1 : Port_33

Port level statistics collection: currently disabled.
Inter-Segment Statistics collection is disabled
49:ASN-9000:media#
```

7.2 Inter-Segment Statistics

If statistic collection is enabled, the **isstats show** command can be used to display, clear, enable, or disable the statistics collection for packets between segments on installed ASN-9000 NIMs. The syntax of this command is as follows:

```
isstats [show] [<params>] [<disp-restrictors>]
isstats clear|enable|disable
```

where

<params> Specifies a comma-separated list of packets (**p**) or octets (**o**).

[<disp-restrictors>] Specifies an optional list of segments from which to collect statistics. Specify a `fr[om]=<seglist>` and `to=<seglist>` list of segments.

The following example displays the inter-segment statistics for packets sent from segment 1.1 to segment 2.1.

```
52:ASN-9000:media# isstats p fr=1.1 to=2.1
Segment to segment statistics collection is disabled
FROM        TO>          2.1
1.1  : pkts                0

53:ASN-9000:media#
```

7.3 Ethernet LED Modes

The **ledmode** command is not applicable to the *ForeRunner* ASN-9000.

7.4 Monitoring a Segment

The **monitor** command is not applicable to the *ForeRunner* ASN-9000.

7.5 Operating-Mode

The **`operating-mode|om`** command is not applicable to the *ForeRunner* ASN-9000.

7.6 UTP Port Receiver Status

The **`portreceive|pr`** command is not applicable to the *ForeRunner* ASN-9000.

7.7 Displaying Port-Level Statistics

The **`portstats`** command is not applicable to the *ForeRunner* ASN-9000.

7.8 Configuring Packet Forwarding on Segments

The **segment** command is used to enable or disable forwarding of packets on segments. Under certain circumstances it is desirable to disable the transmission and reception of packets on a specific segment. The syntax for this command is as follows:

segment penable|pdisable <segment-list>

where

<segment-list> Specifies a segment, dash-separated range of segments, or a comma-separated list of segments.

The following example disables segment forwarding on segment 1.16.

```
55:ASN-9000:media# segment pdisable 1.16
Segment 1.16: disabled
56:ASN-9000:media#
```

7.9 Segment Names

The **segmentname|name** command can be used to change the default port names of ports in the ASN-9000. When the system first boots and assigns segments, segment numbers are assigned from bottom to top and the segments are named starting with "Port_1." The syntax for this command is as follows:

segmentname|name sset <name> <seglist>
segmentname|name [show] [<seglist>]

where

sset Sets the segment name for the specified segment or segments.

<name> Specifies the name to use as a replacement for the default "Port_*x*" name. This variable is not required when using the **show** argument. The assigned name cannot exceed 23 characters or contain any spaces.

<seglist> Specifies the segment number of the segment to be renamed. This variable must be a single segment number when renaming a segment. This variable may be a dash-separated range or a comma-separated list when used with the **show** argument. When the **show** argument is used and the <*seglist*> variable is not used, all segments are displayed.

The following example renames segment 2.1 from Port_33 to Marketing, indicating that this segment is connected to the Marketing department.

```
49:ASN-9000:media# segmentname sset Marketing 2.1
Segment 2.1 named: Marketing
51:ASN-9000:media# segmentname show 2.1
Segment names:
2.1 : Marketing
52:ASN-9000:media#
```

7.10 Segment-State Detection

The **ssd** command is used to set Segment State Detection on specified segments. The syntax for this command is as follows:

```
ssd [show] [<seglist>]
ssd penable|pdisable [<seglist>]
```

where

[<seglist>] Specifies the segment, or segments, to display the current segment state detection state. If no segments are specified, all segments are displayed.

penable|pdisable Specifies to either enable or disable segment state detection on the specified segment, or segments.

The following example displays the current state of segment 1.16 and then disables segment state detection on segment 1.16:

```
78:ASN-9000:media# ssd 1.16
Automatic detection of ports state:
Segment  1.16: enabled (currently bad)
79:ASN-9000:media# ssd pdisable 1.16
Segment  1.16 : disabled
80:ASN-9000:media#
```

7.10.1 Automatic Segment-State Detection

Automatic segment-state detection recognizes if a segment is down and automatically disables bridging and routing on that segment. When it has been detected that the state of a segment has changed, the segment is disabled (taken out of service) and the software is marked to denote the change. The updated segment state is displayed when the **ssd** command is issued.

If automatic segment-state detection is disabled on a segment, the segment's state is always reported as "good" and interface states are always reported as "up." For information about the state of a segment or interface, enable automatic segment-state detection on that segment.

The method used to determine whether a segment is down differs depending upon the type of segment. Table 7.1 lists the methods used to determine the state of each type of segment.

Table 7.1 - Segment-State Detection Methods

Segment Type	Segment is Determined To Be Down If
ATM	The ELAN goes down or the physical link to the AMA goes down.

7.10.1.1 Software Behavior When Disabled

When a segment is disabled, no packets are bridged or routed on that segment. Bridging and routing do not occur regardless of whether the segment is disabled by automatic segment-state detection or by issuing the **`segment pdisable`** command (see Section 7.8).

7.10.1.2 Default Setting

The default setting for the automatic segment-state detection differs depending upon the segment type. Table 7.2 lists the default setting for each segment type.

Table 7.2 - Automatic Segment-State Detection Default Settings

Segment Type	Default
ATM	Enabled

As shown in Table 7.2, ATM segment types have automatic segment-state detection enabled by default. In general, automatic segment-state detection should be left at the factory default settings.

7.11 Segment-State Detection Threshold

The **ssdthreshold|ssdt** command is not applicable to the *ForeRunner* ASN-9000. ATM segments are down if the ELAN on the segment goes down or the physical link to the PHY goes down. In these cases, no threshold is shown.

7.12 Status

The **status** command is used to display the port-level status of the specified, or all, ports on in the system. The syntax for this command is as follows:

status [show] [<params>] [<display-restrictors>]

where

[<params>]	Optionally specifies a comma-separated list of link, partition, polarity. If no parameters are specified, status of all ports is displayed.
[<display-restrictors>]	Optionally specifies a segment, range of segments or a comma separated list of segments to display port status.

As shown in the example below, the Link Test, Partitioning and Polarity of all UTP ports is displayed.

```
90:ASN-9000:media# status
Link Test:
Slot  2:  Y  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
Slot  1:  Y  -  -  -  -  -  -  -  -  -  -  -  -  -  -  Y  -  -  -  -  -  -  -  -
-  -  -  -  -  -  -  -

Partitioning:
Slot  2:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Slot  1:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
.  .  .  .  .  .  .  .

Polarity:
Slot  2:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
Slot  1:  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
.  .  .  .  .  .  .  .

91:ASN-9000:media#
```

7.13 Statistics

The **stats** command is not applicable to the *ForeRunner* ASN-9000.

CHAPTER 8 NVRAM Commands

This chapter explains the commands within the NVRAM subsystem which are used to make changes in the NVRAM subsystem and booting parameters. The following commands are available in the NVRAM subsystem:

```
nvram subsystem:

bo                                  gwip
myip                                crashreboot
mysm                                slotsegs[n]
fsip                                md5key[keyid]
```

8.1 NVRAM Configuration Commands

The NVRAM commands are used to display, set, or clear parameters that affect the ASN-9000 boot order, IP addresses of the system, file server and gateway, the system behavior in the event of a system crash, the number of segments each installed module is to support, and a RIPv2 key (password).

8.1.1 Boot Order

The **bo** command is used to display, set or clear the default booting order. The syntax of this command is as follows:

```
bo set <value>
bo [show]
bo unset
```

where

set Sets the specified boot order. The boot order designates the order of sources from which the system attempts to boot.

<value> Specifies the actual boot order. Values can be **f** (Floppy Diskette or **m** (Flash Memory Module). The boot order can be set to any order. The **n** option (netboot) is not applicable to the ASN-9000.

unset Unsets the specified boot order. Causes the boot order to default to the Floppy Diskette.

If more than one boot source is specified, the system attempts to boot in the order specified. For example: if **fm** is entered, the system attempts to boot from the Floppy Diskette and then the Flash Memory Module.

If more than one boot source is specified, the runtime and configuration files on each should match to prevent an erroneous configuration from being loaded.

The following examples show the results of the various boot order command options:

```
15:ASN-9000:nvram# bo
bo              (not set, defaults to "f")
16:ASN-9000:nvram# bo set fm
17:ASN-9000:nvram# bo
bo              fm  (floppy,flash-module)
18:ASN-9000:nvram#
```

8.1.2 My Internet Protocol Address

The **myip** command is used to display, set or clear the IP address of the ASN-9000. The syntax of this command is as follows:

myip [show]
myip set <ipaddr>
myip unset

where

set Sets the IP address assigned to the ASN-9000.

<ipaddress> Specifies the IP address assigned to the ASN-9000.

unset Unsets and clears the IP address currently assigned.

The following examples display the current assigned IP address and finds that it is unset. The IP address is then set and displayed to verify it was properly set.

```
21:ASN-9000:nvram# myip
myip            (not set)
22:ASN-9000:nvram# myip set 169.144.86.54
23:ASN-9000:nvram# myip
myip            169.144.86.54
24:ASN-9000:nvram#
```

8.1.3 My Subnet Mask

The **mysm** command is used to set the subnet mask of the system. The syntax for this command is:

```
mysm [show]
mysm set <ipaddr-mask>
mysm unset
```

where

set	Sets the IP subnet mask for the system.
<ipaddr-mask>	Specifies the IP subnet mask.
unset	Unsets and clears the IP subnet mask.

The following examples display the current assigned subnet mask and finds that it is unset. The subnet mask is then set and displayed to verify it was properly set.

```
28:ASN-9000:nvram# mysm
mysm            (not set)
29:ASN-9000:nvram# mysm set 255.255.255.0
30:ASN-9000:nvram# mysm
mysm            255.255.255.0
31:ASN-9000:nvram#
```

8.1.4 File Server IP Address

The **fsip** command is used to display, set, or clear the file server IP address associated with the system. The syntax for this command is as follows:

```
fsip [show]
fsip set <ipaddr>
fsip unset
```

where

set	Specifies whether to show, set, or clear the IP address of the file server.
<ipaddress>	A file server's IP address.
unset	

The following examples display the current file server IP address and finds that it is unset. The file server IP address is set and displayed to verify it was properly set.

```
36:ASN-9000:nvram# fsip
fsip            (not set)
37:ASN-9000:nvram# fsip set 169.144.86.49
38:ASN-9000:nvram# fsip
fsip            169.144.86.49
39:ASN-9000:nvram#
```

8.1.5 Gateway IP Address

The **gwip** command is used to display, set or clear the IP address of the gateway router. The syntax for this command is as follows:

gwip [show]
gwip set <ipaddr>
gwip unset

where

set	Sets the IP address of the gateway router.
unset	Unsets and clears the IP address of the gateway router.
<ipaddress>	Specifies the IP address of the intervening router (gateway).

The following examples display the current assigned subnet mask and finds that it is unset. The subnet mask is then set and displayed to verify it was properly set.

The following examples display the use of these commands. In the first example, values are configured into the hub's NVRAM to support "semi-prescient" netbooting.

```
45:ASN-9000:nvram# gwip
gwip            (not set)
46:ASN-9000:nvram# gwip set 169.144.86.1
47:ASN-9000:nvram# gwip
gwip            169.144.86.1
48:ASN-9000:nvram#
```

8.1.6 Crash Reboot

The **crashreboot** command is used to instruct the system to reboot automatically following a system crash. The syntax of this command is as follows:

crashreboot [show]
crashreboot set
crashreboot unset

where

set When set, theASN-9000 automatically attempts a reboot following an unexpected system crash. The default is **`set`**, which causes a reboot to be attempted following a system crash. Do no change this setting unless instructed to do so by FORE Systems TAC.

unset Clears the crash reboot behavior. If this parameter is not set, the system pauses at the Boot PROM prompt (`<prompt-9PE>`) and waits for manual intervention.

```
52:ASN-9000:nvram# crashreboot
crashreboot     (not set)
53:ASN-9000:nvram# crashreboot set
54:ASN-9000:nvram# crashreboot
crashreboot     (set)
55:ASN-9000:nvram#
```

8.1.7 Slot Segments

The **`slotsegs`** command is used to allocate segments to specific slots. Slot segments are set by default and there is no need to manually set them. However, since the larger chassis can be populated with NIMs totalling more segments that the recognized chassis maximum, it may be necessary to manually unset segments that are not in use in order to ensure that all segments in use are allocated. The maximum allowable segment count for anASN-9000 is 96 segments. The syntax for this command is as follows:

```
slotsegs [show]
slotsegs[<n>] [show]
slotsegs[<n>] set <segment-count>
slotsegs[<n>] unset
```

where

[<n>] Specifies the slot number for which segments are being allocated. The brackets are required around the slot number.

set Sets the specified number segments for the specified slot.

<segment-count> Specifies the number of segments being allocated to the specified slot.

unset Clears the segment count for the specified slot.

In the following example, an ASN-9000 has segments allocated as follows:

- Slot 1 has thirty-two segments allocated (PowerCell 700 ATM module).
- Slot 5 is unset and contains the Packet Engine. The Packet Engine slot could also be set to zero (0) segments.

Following the segment allocation display, the total allocated (reserved) segment count for the chassis is displayed. The number of reserved segments is less than the maximum allowable segment count of 96. The segment count for the ATM PowerCell in slot 1 is then decreased to sixteen segments and the setting is then verified.

```
57:ASN-9000:nvram# slotsegs
slotsegs[ 1]    32
slotsegs[ 2]    (not set)
slotsegs[ 3]    (not set)
slotsegs[ 4]    (not set)
slotsegs[ 5]    (not set)
slotsegs[ 6]    (not set)
slotsegs[ 7]    (not set)
slotsegs[ 8]    (not set)
slotsegs[ 9]    (not set)
slotsegs[10]    (not set)
slotsegs[11]    (not set)
slotsegs[12]    (not set)
slotsegs[13]    (not set)
slotsegs[14]    (not set)
slotsegs[15]    (not set)
slotsegs[16]    (not set)
slotsegs[17]    (not set)
slotsegs[18]    (not set)
slotsegs[19]    (not set)
slotsegs[20]    (not set)
Total segments reserved: 32
58:ASN-9000:nvram# slotsegs[1] set 16
59:ASN-9000:nvram# slotsegs[1]
slotsegs[ 1]    16
Total segments reserved: 16
60:ASN-9000:nvram#
```

NOTE

If an INIM has zero (0) slotsegs configured, the software image for that INIM will not be loaded during the booting process and the INIM will appear to be dead or bad. Setting a segment value for the INIM using the **slotsegs[<n>] set <segment-count> command and then rebooting loads the image.**

8.2 RIPv2 Authentication

RIPv2 supports encrypted packet transmission using the MD5 algorithm to authenticate route and table updates. The MD5 algorithm allows packets to be encrypted at a source PowerHub and decoded at a destination PowerHub containing the same encryption key and key-string (password). Because the keyID is not transmitted over the network but is set at each end, it reduces the likelihood of a successful attack on the network.

MD5 authentication is only supported in RIPv2. It does not work in RIPv1. RIPv2 must be enabled and running on all interfaces that require authentication. Additionally, RIPv2 authentication is not supported on interfaces that are configured for both RIPv1 and RIPv2; interfaces must be configured for RIPv2 only.

The MD5 key must be set up on the PowerHubs at both sides of the connected interfaces in order for the authentication to take place. The keyid and the key-string must be the same on both PowerHubs. Refer to RFC-2082 for a discussion on RIPv2 authentication using the MD5 encryption algorithm. The syntax for the **md5key** command is:

md5key [show]
md5key[<keyid>] [show]
md5key[<keyid>] set <key-string>
md5key[<keyid>] unset

where

[keyid] Specifies the number, or identifier, of the MD5key. The number must be a whole number between 1 and 255. There is no space between **md5key** and the keyid when the command is entered. Brackets around the keyid are part of the command and must be included.

set Sets a specific keyid.

unset Unsets a specific keyid.

<key-string> Specifies the password to be used for encryption. The maximum password length is 16 characters.

unset

Examples of the **md5key** command are shown below:

```
65:ASN-9000:nvram# md5key[1] set asn
66:ASN-9000:nvram# md5key
md5key[ 1]      (set)
Total keys reserved: 1
```

```
67:ASN-9000:nvram# md5key[1]
md5key[ 1]      (set)
Total keys reserved: 1
68:ASN-9000:nvram#
```

In this example, key 1 is set with the keyID (password) of “powerhub.” This is the only time the keyID is displayed.

CHAPTER 9 Host Commands

This chapter describes the commands in the `host` subsystem and discusses how to use these commands to perform the following tasks:

- Display the TCP configuration settings.
- Display the TCP table.
- Display TCP, TELNET, and UDP statistics.
- Clear TCP, TELNET, and UDP statistics.
- Set the connection time.
- Set the keep-alive interval.
- Kill a TCP connection.
- Display the UDP table.

The `host` subsystem includes an implementation of the Transmission Control Protocol (TCP) stack, a connection-oriented, industry-standard protocol for moving data between nodes in a network environment. In particular, TCP is used by TELNET, a program that allows workstations to communicate using either an in-band or outbound network connection. To define TCP filters, refer to the ForeRunner ASN-9000 *Filters Manual*.

9.1 Accessing the Host Subsystem

To access the `host` subsystem, issue the following command at any runtime command prompt:

`host`

The following commands are available in the host subsystem:

```
config                          kill
filter                          stats
kainterval|kai                  status
 kadelay|kad                    template
```

The filter and template commands are discussed in the ForeRunner ASN-9000 *Filters Reference Manual*.

9.2 Displaying the Configuration

The **config** command is used to display configuration parameters used by the host subsystem. The syntax for this command is:

config [show] tcp|fi[lters]|ru[les]|tem[plates] [<disprestrictions>]

where

tcp|fi[lters]|ru[les]|tem[plates] Specifies whether to display the TCP configuration, configured host filters, rules or templates.

[<disprestrictions>] Optionally, the configuration information pertinent to a specific segment, or segment list, can be displayed. If no restrictions are supplied, the specified configuration is displayed for all segments.

The following example shows the displays associated with each of the required command line arguments.

```
104:ASN-9000:host# config tcp
TCP Configuration
-----------------
Round Trip Algorithm:                    vanj
Min Rexmit Interval:                     1000 ms
Max Rexmit Interval:                    64000 ms
Max Connections Allowed:                    2
connection-idle-time:                      20 minutes
keep-alive interval [kainterval]:          75 seconds
keep-alive delay [kadelay]:      1200 seconds
Time to disconnect on idle conn:           30 minutes 0 seconds

105:ASN-9000:host# config fi
Host Filter Template Definitions
Filter    Templates
------    ---------
Host Receive Filter attachments
Segment        Filter

107:ASN-9000:host# config ru
Host Filter Template Definitions
Filter    Templates

108:ASN-9000:host# config tem

T#       Source IP address/mask      Destination IP address/mask   ipproto
TCP/UDP source port     dest port   TCP conreq    Action
================================================================================
```

The first example displays the following information about the current TCP configuration parameters:

- The round-trip algorithm used is the Van Jacobson algorithm.
- The minimum retransmit interval is 1,000 milliseconds.
- The maximum retransmit interval is 64,000 milliseconds.
- The maximum number of simultaneous TELNET (TCP) connections that can be supported is two.
- The connection-idle time is 20 minutes.
- The keep-alive interval is 75 seconds.
- The keep-alive delay is 1200 seconds.
- The time allowed before an idle connection is automatically disconnected is 30 minutes. This value is based on the values of the connection-idle time and the keep-alive interval.
- The other examples display any configured host filters, rules or templates. This particular system has no filters, rules, or templates configured.

9.3 Keep Alive Delay

The **kadelay|kad** command is used to specify how long a TELNET connection can remain idle before keep-alive packets are sent. The keep alive delay is specified in seconds. The syntax for this command is as follows:

kadelay|kad set <time>

where

<time> Specify in seconds the number of minutes to allow a TCP (TELNET) connection to remain idle before sending keep-alive packets. The range is **5** to **30** minutes; the default is **20** minutes.

The following example sets the keep alive delay to six minutes (360 seconds).

```
120:ASN-9000:host# kad set 360
121:ASN-9000:host#
```

9.4 Keep Alive Interval

The **kainterval|kai** command is used to specify how often keep-alive packets are sent before a connection is closed. The syntax for this command is as follows:

kainterval|kai set <time>

where

<time> Specifies how often keep-alive packets are sent before a connection is closed. The range is **30** to **240** seconds; the default is **75** seconds.

The following example sets the keep alive interval to 180 seconds, or 3 minutes.

```
122:ASN-9000:host# kai set 180
123:ASN-9000:host#
```

9.5 Ending (Killing) a TCP Connection

The **kill** command is used to end a TCP connection other than the active session. This command must be issued from a session other than the active one. The syntax for this command is as follows:

kill <connection-id>

where

<connection-id> Specifies the ID assigned to the session when the session was established. To determine what the connection ID is, use the **status tcp** command to display the active TCP connections. The connection IDs are listed under Conn ID.

The following example checks the current TCP connections, using the **status tcp** command, and then kills the connection labeled Conn ID 16.

```
192:ASN-9000:host# status tcp

                      Active TCP Connections
Conn Id  Rem IP Addr      Rem Port  Loc IP Addr      Loc Port  Conn. State
-------  --------------  --------  --------------  --------  ------------
16       169.144.86.49    23        169.144.86.54    1494      ESTABLISHED
193:ASN-9000:host# kill 16
194:ASN-9000:host#
```

9.6 Statistics

The **stats** command is used to display or clear statistics on TCP, TELNET, and UDP packets. TCP and UDP statistics are a superset of the corresponding statistics provided in the SNMP MIB. (There is no TELNET MIB.) The software maintains two types of stats for TCP, TELNET, and UDP statistics counter:

- Count since last statistics clear.
- Count since last system reset.

The syntax for this command is as follows:

```
stats clear [-i] [-t] tcp|tel[net]|udp|all
stats [show] [-i] [-t] tcp|tel[net]|udp|all
```

where

clear Specifies to clear the specified statistics or all statistics.

-i Valid only for TCP. Displays, or clears, TCP statistics such as connections established, dropped, closed, etc.

-t Displays total statistic count since last system reset of the specified protocol, or all, if specified.

tcp|tel[net]|udp Specifies for which type of protocol to clear the statistics. If all is specified, statistics for all protocols are displayed or cleared.

The following example displays the statistics for all protocols, TCP, Telnet and UDP.

```
144:ASN-9000:host# stats
Telnet Data Statistics (count since last stats clear):
Pkts Rcvd From Net:              2308
Pkts Sent To Net:               17070
Bytes Rcvd From Net:             2933
Bytes Sent To Net:              45790
Bytes Rcvd From CLient:         43303
Bytes Sent To Client:            2556
Conn Opens Rcvd:                    9
Conn Rejects Sent:                  0
Conn Aborts Sent:                   0
Conn Aborts Rcvd:                   1

TCP Connection & Pkt statistics (count since last stats clear):
Active Opens:                       4
Passive Opens:                      9
Failed Conn Attempts:              13
```

```
Resets In Estb State:               0
Current Open Conns:                 4
Segments Received:               6402
Segments Sent:                   7567
Rexmitted segments:                 0
Segments Rcvd With Err:             1
Resets Sent:                       37
Short Segments Rcvd:                0

UDP statistics: count since last stats clear
Datagrams received:                 738
Unknown destination ports received: 11
Errors received:                    0
Datagrams discarded:                0
Datagrams sent:                     746

145:ASN-9000:host#
```

9.7 Status

The **status** command is used to display active TCP and/or UDP connections. The syntax for this command is as follows:

status [show] tcp|udp

where

tcp|udp Specifies to display either the TCP or UDP active connections. If neither is specified, both are displayed.

Following is an example of the TCP table:

```
197:ASN-9000:host# status

                              Active TCP Connections
Conn Id  Rem IP Addr      Rem Port  Loc IP Addr      Loc Port  Conn. State
-------  --------------  --------  --------------  --------  ------------
17       169.144.86.49    23        169.144.86.54    1495      ESTABLISHED **
List of registered UDP clients:
161 snmp
520 rip
198:ASN-9000:host#
```

For each TCP connection, the following information is displayed:

Conn ID A unique integer that identifies the connection. This identifier can be used to terminate the connection using the **kill <connection-id>** command.

Rem IP Addr The IP address of the remote device that initiated the connection.

Rem Port A process port number for the remote device (management station). Note that the process port number is unrelated to the physical port or segment numbers. It is assigned by the remote operating system.

Loc IP Addr The IP address of the local device. This is always the ASN-9000.

Loc Port A process port number. Unrelated to the physical port or segment numbers. It is a “well-known” port number used by the TELNET process.

Conn. State The connection state of the standard TCP state machine:

CLOSEDCLOSING
CLOSE-WAITESTABLISHED
FIN-WAIT-1FIN-WAIT-2
LAST-ACKLISTEN
SYN-RECEIVEDSYN-SENT
TIME-WAIT

Most of these states are never displayed by the **`status tcp`** command because they occur for a very brief time. Connections in the CLOSED or LISTEN state are not displayed.

The current TELNET session (if connected through TELNET) is indicated by two asterisks (**) following the table entry for that session.

The status information for UDP clients includes the number of registered SNMP and RIP clients. The numbers and names are "well-known" UDP protocol port numbers and names as defined in RFC 1700.

The UDP ports listed in this display indicate that agents for processing UDP packets are sent to UDP protocol ports 161 and 520. In other words, the following types of UDP packets are supported:

- SNMP
- IP RIP

CHAPTER 10 Bridge Commands

The ASN-9000 contains implementations of IEEE 802.1d bridging and the 802.1d Spanning-Tree protocol. This chapter describes the `bridge` subsystem commands that can be used to perform the following tasks:

- Display the bridge configuration
- Display and manage the bridge table (includes changing the aging interval for dynamic (learned) entries)
- Display, add, and delete bridge groups
- Display the bridging status of a segment
- Enable, disable, and configure Spanning-Tree Protocol
- Display or clear packet, bridge, and segment statistics
- Display and clear the bridge cache

10.1 Accessing the Bridge Subsystem

To access the `bridge` subsystem, issue the following command from any command prompt:

`bridge`

The following commands are located in the bridge subsystem:

```
aging                          ipx-br-translation|ibt
bridging|br                    learning|learn
bt                             lrule
cache                          relearn-log|rl
config                         spantree|st
filter                         stats
getmem                         status
group                          template
```

Commands related to the configuring of filters; `filter`, `lrule`, and `template` are discussed in the ForeRunner ASN-9000 *Filters Reference Manual.*

10.2 Aging

The **aging** command is used to set or unset (disable) the bridge table aging time. Aging is a mechanism that periodically clears learned entries from the table. Only dynamic entries (entries learned and not configured manually) are aged by the software. Static entries (those created by the user) do not age.

At the interval specified (the aging interval), the software determines which of the learned entries in the table have not been used recently. Each learned entry that has not been used during the specified interval is marked aged. This value shows up in the Flags column of the bridge table.

If an entry marked aged is used during the next aging interval, the aged flag is removed and the entry remains in the table. However, if an entry marked aged is unused during the next interval, the entry is removed from the table. The syntax for this command is as follows:

aging set <time>
aging unset

where

<time> Specifies the aging time to clear learned entries in seconds. Aging time must be specified in integrals of 60 seconds. Default is 60 minutes (3600 seconds).

In the following examples, the aging time is displayed (60 minutes), then disabled (unset) and set to 30 minutes.

```
9:ASN-9000:bridge# aging
Bridge table aging time: 60 minutes
10:ASN-9000:bridge# aging unset
Aging time specified is short. Shorter Aging time
may affect Powerhub performance
Bridge Table aging turned off
11:ASN-9000:bridge# aging set 1800
Bridge Table aging time set to 30 minutes
12:ASN-9000:bridge#
```

10.3 Bridging

The **bridging|br** command is used to display, enable and disable bridging. If the command is entered without an argument, the current bridging status is displayed. The syntax for this command is as follows:

```
bridging|br [show]
bridging|br pen[penable] <segment-list>|all
bridging|br pdis[able] <segment-list>|all
```

where

pen[penable] Enables bridging on the specified segment, or segment list.

pdis[able] Disables bridging on the specified segment or segment list.

<segment-list>|all Specifies the segments on which to enable or disable bridging. Specify one segment, a comma-separated list of segment, and/or ranges of segments. If **all** is specified, bridging is enabled or disabled on all available segments.

The following example displays the bridging status of all segments:

```
14:ASN-9000:bridge# br
Port        Bridging Status
1.1         Disabled
1.2         Disabled
1.3         Disabled
1.4         Disabled
1.5         Disabled
1.6         Disabled
1.7         Disabled
1.8         Disabled
1.9         Disabled
1.10         Enabled
1.11         Enabled
1.12         Disabled
1.13         Enabled
1.14         Enabled
1.15         Enabled
1.16         Enabled
2.1         Disabled
2.2         Disabled
2.3         Disabled
2.4         Disabled
2.5         Disabled
```

```
2.6         Disabled
2.7         Disabled
2.8         Disabled
2.9         Disabled
2.10         Enabled
2.11         Enabled
2.12         Enabled
2.13         Enabled
2.14         Enabled
2.15         Enabled
2.16         Enabled
4.1         Disabled
15:ASN-9000:bridge#
```

The following example disables bridging on segments1.10, 1.11 and 1.13 through 1.16:

```
28:ASN-9000:bridge# br pdis 1.10,1.11,1.13-1.16
29:ASN-9000:bridge#
```

10.4 Bridge Table

The **bt** command is used to add, delete, display or clear bridge table entries. The bridge table contains information about attached devices. Entries in the bridge table are used to bridge packets. Entries can be added to the table automatically or manually.

Each time the bridging engine receives a packet, it checks the packet's source address against the MAC addresses listed in the bridge table. If the address is not listed in the table, an entry is added to the table. The entry contains the source device's MAC address, the segment number on which the packet was received, and other information used for bridging.

Static entries are created using the **add** argument. A static entry is manually added to the bridge table, rather than learned by the bridge table. Static entries are not subject to aging and remain in the bridge table until removed. Moreover, they are saved in the configuration file when the configuration is saved (see Chapter 6). The syntax for this command is as follows:

```
bt add <ethaddr> <seglist>
bt delete <ethaddr>
bt [show] [-h] [-m] [-t] [<disprestrict>]
bt clear
```

where

<ethaddr>	Specifies the MAC-layer address of the device to add or delete bridge-table entries. Specify the address as six hyphen-separated two-digit hexadecimal octets (ex: **08-00-20-0f-a5-ab**).
<seglist>	Specifies the segment or segments to add to the bridge table.
[-h]	Displays the hash displacements for the specified entries.
[-m]	Displays entries for multi-homed hosts.
[-t]	Displays the total number of entries in the table. The total is comprised of all learned and permanent (static) entries. This argument also shows how many entries remain available in the bridge pool; that is, the number of entries for which the table still has room.
[<disprestrict>]	Optional display restrictions of a[ddr]=<ethaddr> | <ethpat> [[seg[ment[s]]]=]<seglist>

NOTE

Because the **-h** and **-m** options display specific entries in the bridge table, they cannot be used with the **-t** option, which displays total bridge entries.

The following examples clear the bridge table entries. The bridge table is then displayed in its entirety and then with the **-t** and **-h** optional arguments.

```
14:ASN-9000:bridge# bt clear
Ok
15:ASN-9000:bridge# bt

Bridging table (aging time = 60 minutes)
Ethernet-address   Seg   Rule  Flags
00-00-ef-03-9a-b0   --   none  system permanent
00-20-48-08-8f-85  2.1   none
00-20-48-04-ef-a7  2.1   none
ff-ff-ff-ff-ff-ff   --   none  permanent bmcast

Total entries: 4, Learned entries: 2, Permanent Entries: 2
16:ASN-9000:bridge# bt -t

Total entries: 6, Learned entries: 4, Permanent Entries: 2
Total entries in free pool 8186
17:ASN-9000:bridge# bt -h

Bridging table (aging time = 60 minutes)
Ethernet-address   Seg   Rule  Flags
Hash: 273, collision displacement: 0
00-a0-98-00-09-d3  2.1   none
Hash: 319, collision displacement: 0
08-00-20-1f-fa-fa  2.1   none
Hash: 9b3, collision displacement: 0
00-00-ef-03-9a-b0   --   none  system permanent
Hash: 1594, collision displacement: 0
00-00-ef-04-86-90  2.1   none
Hash: 17ad, collision displacement: 0
00-20-48-08-8f-85  2.1   none
Hash: 17cb, collision displacement: 0
00-20-48-04-ef-a7  2.1   none
Hash: 1ffd, collision displacement: 0
ff-ff-ff-ff-ff-ff   --   none  permanent bmcast

Total entries: 7, Learned entries: 5, Permanent Entries: 2
18:ASN-9000:bridge#
```

The bridge table contains the following information for each entry:

Ethernet-address The MAC-layer hardware address of the device.

Seg (Segment) The segment to which the network joining the device is attached. If the MAC-layer hardware address belongs to a multi-homed host, the segment number is shown as MH.

Rule The number of a logical filtering rule applied to packets forwarded to or from this address. Refer to the ForeRunner ASN-9000 *Filters Reference Manual* for information about defining rules.

Flags Certain flags are maintained in order to use and manage addresses in the bridge table. For example, entries such as the address of the ASN-9000 are marked, and entries that haven't been used recently are flagged for possible deletion (aging).

Each entry in the bridge table can have one or more of the following flags:

bmcastA broadcast / multicast address.

permanentMost often, this flag indicates that the address is a static entry. Otherwise, it is a switch-defined entry.

spanning-treeThe industry-standard (IEEE 802.1d) multicast address used by the Spanning-Tree algorithm.

systemThe factory-configured MAC-layer hardware address of theASN-9000.

blankIn a typical application, most entries in the bridge table have none of the preceding flags set. Such entries are learned addresses that have been seen at least once since the last time the bridge table was aged.

10.5 Cache

The **cache** command is used to display or clear bridge cache entries. Each time the bridging engine bridges a packet, it creates an entry in the bridge cache containing the packet's destination and source Ethernet MAC address. The bridge cache is frequently updated with the most recently used source-destination pairs and provides a fast path for bridge traffic resulting in increased performance. The bridge cache can be used for at-a-glance information about the current bridge traffic in the network. The syntax for this command is as follows:

```
cache [show] [<disprestrict>]
cache clear
```

where

[<disprestrict>] Specifies the segments for which to display the cache entries. Specify a single segment, a comma-separated list of segments, or a hyphen-separated range of segments.

The following example shows a brief list of cache entries.

```
17:ASN-9000:bridge# cache
Bridging cache:
Port 01: Dest: 08-00-20-08-70-54, Source: 08-00-20-0f-dd-99
         Dest: 00-00-6b-82-3f-34, Source: 08-00-20-0f-6c-96
         Dest: 08-00-20-08-85-69, Source: 08-00-20-0f-dd-99
         Dest: 08-00-20-08-70-54, Source: 08-00-20-0f-6c-96
Port 02: Dest: 00-00-6b-82-3f-34, Source: 08-00-20-0e-ae-03
         Dest: 00-00-94-06-79-12, Source: 08-00-20-10-56-53
         Dest: 08-00-20-08-85-69, Source: 00-00-6b-82-3f-34
         Dest: 08-00-20-08-70-54, Source: 08-00-20-0e-ae-03
Listing continues
Port 21: empty
Port 22: empty
Port 23: empty
Port 24: empty
18:ASN-9000:bridge#
```

10.6 Configuration

The **config** command is used to display the bridge configuration parameters. The syntax for this command is as follows:

config [show] [<params>] [<disprestrict>]

where

[<params>] Specifies the configuration parameters to display. Specify an argument, a comma-separated list of arguments, or **all** for all arguments. Table 10.1 lists the arguments that can be specified. The default is **all**.

[<disprestrict>] Specifies the segment or segment list to display the configuration information

.

Table 10.1 - Configuration Arguments

Argument	Description
vars	The aging time for entries in the bridge table. This also shows if learning is enabled.
groups	The currently defined network bridge groups.
templates	All defined logical filtering templates (refer to ForeRunner ASN-9000 *Filters Reference Manual*).
rules	All defined logical filtering rules (refer to ForeRunner ASN-9000 *Filters Reference Manual*).
filters	The packet-forwarding restrictions for all segments. This includes the source and destination logical filtering rules and whether or not learned entries are blocked (refer to ForeRunner ASN-9000 *Filters Reference Manual*).
st	All configured Spanning-Tree Algorithm parameters.

The following example shows the type of information displayed by the **config** command when issued without arguments. Some areas have been shortened for brevity.

```
347:ASN-9000:bridge# config
Spanning Tree
Status :                Disabled
System Priority :       8000
Spanning Tree Address :  01:80:c2:00:00:00
My Bridge Address :     00:00:ef:03:9a:b0
```

```
Max Age :                21
Hello Time :             4
Forward Delay :          16
Sending Fast Hellos :    Disabled
Fast Hello Params :      Hello Time: 1 sec, High Util: 70%, Low Util: 50%

Segment  Prio  Path Cost  Designated Bridge  Des Seg  Des Cost  Sta Chngs
-------  ----  ---------  -----------------  -------  --------  ---------
1.1      80    -          -                  -        -         -
.
4.1      80    -          -                  -        -         -

Bridge learning
segment 1.1: on
.
Segment 4.1: on

Bridge table aging time: 60 minutes

Bridge Groups:
Name                     Segment List
------------------------ ------------------------
default                  1.1, 1.2, 1.3, 1.4, 1.5,
                         1.6, 1.7, 1.8, 1.9, 1.10,
                         1.11, 1.14, 1.15, 1.16, 1.17,
                         1.18, 1.19, 1.20, 1.21, 1.22,
                         1.23, 1.24, 1.25, 1.26, 1.27,
                         1.28, 1.29, 1.30, 1.31, 1.32,

Filter templates
Number  Offset(dec)  Mask(hex) Comparator(hex)
099     004          00000000   00000000

Filter rules
Number  Description
163     99

Filters applied
Segment     Transmit     Receive
1.1       -            -
.
4.1       -            -
348:ASN-9000:bridge#
```

10.7 Allocate Memory

The **getmem** command is used to allocate memory for bridge table MIB processing. The syntax for this command is as follows:

getmem [br]mib

The following examples shows the use of this command.

```
392:ASN-9000:bridge# getmem mib
Memory allocated for Bridge table MIB processing.
393:ASN-9000:bridge#
```

10.8 Bridge Groups

The **group** command is used to define (set) or clear (unset) network groups. Network groups are a specific subset of network segments among which packets can be bridged, creating a Layer-2-only VLAN. A packet from one segment in the network group can be bridged only to the other segments in the network group. Up to 32 network groups can be defined. Group membership can overlap segments and each segment can belong to all, some, or none of the network groups.

As shipped from the factory, the bridging engine contains one network group known as **default**. All attached segments automatically belong to this network group. The group is added to the configuration file when the configuration is saved (see Chapter 6).

When the configuration file is saved, the default group is automatically added to the configuration file. If the configuration requires that not all segments belong to a common network group (for example, if groups were defined with restricted sets of segments), be sure to delete the default group before saving the configuration file.

The syntax for this command is as follows:

```
group pset <groupname> <seglist>
group punset <groupname>
```

where

<groupname> Specifies the name of the network group. Specify any alphanumeric string up to 15 characters in length.

<seglist> Specifies the segment(s) that belongs to the network group. Specify a single segment, a comma-separated list of segments, or a hyphen-separated range of segments. If **all** is specified, all segments are added to the network group.

NOTE

To create a new **default** group, specify **all** or list all the segments as the <seglist>. If a <seglist> is specified instead of **all**, and the <seglist> does not include all the segments, a network group called **old_default** is created. This default group is stored in the configuration file when saved.

The following example creates a bridge group called pubs using segments 2.1 through 2.6:

```
57:ASN-9000:bridge# group pset pubs 2.1-2.6
Group pubs with ports 2.1-2.6: added
58:ASN-9000:bridge#
```

10.9 IPX Bridge Translation

The **ipx-br-translation|ibt** command is not applicable to the *ForeRunner* ASN-9000.

10.10Learning

The **learning|learn** command is used to enable or disable bridge learning on specified segments. When bridge learning is enabled, MAC addresses from received packets are recorded. The learned MAC addresses are used to return packets to those destinations. By default, bridge learning is enabled when the system is loaded. The syntax for this command is as follows:

```
learning|learn pen[penable] <seglist>|all
learning|learn pdis[able] <seglist>|all
```

where	
pen[penable]	Enables bridge learning on the specified segments.
pdis[able]	Disables bridge learning on the specified segments.
<seglist>	Specifies the segment(s) on which bridge learning is to be enabled or disabled. Specify a single segment, a comma-separated list of segments, or a hyphen-separated range of segments. Specify **all** if bridge learning is to be enabled or disabled for all segments.

The following examples disable bridge learning on a segment, bridge learning is then enabled on that segment.

```
12:ASN-9000:bridge# learn pdis 2.1
Learned disabled on segment 2.1
13:ASN-9000:bridge# learn penl 2.1
Learning enabled on segment 2.1
14:ASN-9000:bridge#
```

10.11Relearn Log

The **relearn-log|rl** command is used to display a log of learned MAC addresses on different segments. Also displayed are the previous segments the MAC address was learned on. The syntax for this command is as follows:

relearn-log|rl

The following example shows the relearn log is empty.

```
16:ASN-9000:bridge# rl
Bridge Relearn Log is EMPTY
17:ASN-9000:bridge#
```

10.12Spanning Tree

The **spantree|st** command is used to enable, disable, and set Spanning-Tree algorithm options. The Spanning-Tree algorithm is a mechanism that logically eliminates physical loops in a bridged network. For example, if bridges are configured in such a way that broadcast/multicast packets are eventually forwarded back to the bridge that first sent them, the network contains a loop. Unless the network topology or bridges are re-configured to break this loop, or implement a mechanism to logically break the loop, broadcast/multicast packets are forwarded from bridge to bridge indefinitely, clogging the network. Whenever a segment's state is changed, either by automatic segment-state detection or by a user-interface command, the Spanning-Tree algorithm adjusts the network topology accordingly. When the Spanning-Tree algorithm is enabled, using the **spantree** command (see Section 10.12), the following Spanning-Tree parameters can be fine tuned:

- Bridge priority
- Segment priority
- Timer threshold
- Spanning-Tree path cost
- Fast hello-time thresholds (if the fast hello-time feature is enabled)

The first four parameters are always used; the last one is optional. The following sections describe how to adjust these parameters. The syntax for this command is as follows:

```
spantree|st en[enable]|dis[able]
spantree|st en[enable]|dis[able] fast-hello
spantree|st set maxage <time>
spantree|st set hello <time>
spantree|st set fwddelay <time>
spantree|st set fast-hello <time>
spantree|st set high-util <percentage>
spantree|st set low-util <percentage>
spantree|st set bridge-priority|bp <priority>
spantree|st sset seg-priority|sp <priority> <seglist>
spantree|st sset path-cost|pc <path-cost> <seglist>
```

where

en[enable]|dis[able]	Specifies whether the Spanning-Tree algorithm or fast-hellos are to be enabled or disabled. The default is **disable**.

<time>	Specifies the time to be set for: maxage of the bridge-timer threshold. The range is 6-40 seconds. The default is **21** seconds. hello time of the bridge-timer threshold. The range is 1-10 seconds. The default is **4** seconds. fwddelay time of the bridge-timer threshold. The range is 4-30 seconds. The default is **16** seconds. The fast hello (1-10) default is **1** second.
<percentage>	Specifies the percentage to be set for: high-util (range is 1-100%). The default is **70%** low-util (range is 1 - 100%). The default is **50%**.
<priority>	Specifies the hexadecimal priority level assigned to: bridge-priority (range **0** to **FFFF**). The default is **80** hex seg-priority (range **0** to **FF**). The default is **80** hex. When specifying seg-priority, a separate priority must be assigned for each segment specified.
<seglist>	Specifies the segments to which priority has been assigned. Specify a single segment, a comma-separated list of segments, or a hyphen-separated range of segments.
path-cost	Specifies the cost of the path. Specify a value from 1 to 65535.

To display the current settings for these parameters, issue the following command:

config st

Following is an example of the display produced by the **config st** command, shortened for brevity:

```
62:ASN-9000:bridge# config st

Spanning Tree
Status :                  Disabled
System Priority :         8000
Spanning Tree Address :   01:80:c2:00:00:00
My Bridge Address :       00:00:ef:03:9a:b0
Max Age :                 21
Hello Time :              4
Forward Delay :           16
Sending Fast Hellos :     Disabled
Fast Hello Params :       Hello Time: 1 sec, High Util: 70%, Low Util: 50%
```

```
Segment  Prio  Path Cost  Designated Bridge  Des Seg  Des Cost  Sta Chngs
-------  ----  ---------  -----------------  -------  --------  ---------
1.1      80    -          -                  -        -         -
.
.
4.1      80    -          -                  -        -         -
63:ASN-9000:bridge#
```

10.12.1 Fast-Hello Time

Under heavy network traffic, Spanning-Tree hello packets are not transmitted at regular hello-time intervals. Such irregular time intervals can delay the transmission of hello packets. If hello packets are delayed past a certain time value, called the maximum age, the Spanning-Tree state can change. If the segment state is “blocking,” and hello packets are not received before the Max Age time value, the Spanning-Tree state changes to “listening” and then to “learning.”

This feature is by default disabled. Issue the **`config st`** command to display the Spanning-Tree settings, then check the value in the Sending Fast Hellos field.

10.12.2 High- and Low-Utilization Percentage

If the fast hello timer feature is enabled, when a segment’s utilization exceeds an upper-end value (<*high-util*>), the software automatically compensates for the increased traffic by using fast hello time to transmit hello packets. The fast hello time is less than the normal (configured) hello time. When all segments’ utilizations drop below a lower-end value, <*low-util*>, the hello time reverts to normal (either previously configured or system defaults).

The high and low utilization percentage values specify the upper-end value of segment utilization. If segment utilization exceeds this value and the fast hello timer feature is enabled, the software automatically compensates for the increased network traffic.

10.13Statistics

The **stats show** command is used to display or clear bridge statistics of bridge table misses. When the clear argument is specified, all bridge statistics are cleared to zero (0), then statistics gathering begins. Once cleared, the statistics shown in the stats displays show the counts since the most recent clear, rather than since the most recent reboot. The syntax for this command is as follows:

stats clear
stats [show]

The following example shows the bridge statistics entries for bridge table misses:

```
64:ASN-9000:bridge# stats
Table misses
04/49           0           0           -           -           -           -
02/33           0           0           0           0           0           0
01/01           0           0           0           0           0           0
65:ASN-9000:bridge#
```

10.14Status

The **status show** command is used to display the bridge spanning tree status for each segment. When this command is issued, the bridge status can differ depending on whether bridging or routing are enabled on particular segments. The syntax for this command is as follows:

status [show]

In the following example, a subset of segments is displayed, for brevity, showing the Spanning Tree status of those segments.

```
66:ASN-9000:bridge# status
Segment   Segment Name              Spanning-tree
--------  ------------------------  -------------
1.1     Port_1                    forwarding
1.3     Port_3                    disabled
1.32    Port_32                   disabled
2.1     Port_33                   forwarding
2.2     Port_34                   disabled
2.5     Port_37                   forwarding
2.16    Port_48                   disabled
4.1     Port_51                   disabled

67:ASN-9000:bridge#
```

For bridge or VLAN traffic to be forwarded on the segment, the Spanning-Tree state must be forwarding. The Spanning-Tree state does not affect routed traffic on the segment.

Note that the Spanning Tree state blocking does not indicate a problem in your network. As described in Section 10.12, the Spanning-Tree algorithm breaks loops in the bridge network by blocking certain segments. The columns in this display show the following information:

Segment The segment number listed in this column corresponds to the physical location of the segment in the PowerHub chassis. Use the **system config show** command to display information about a segment's physical location in the chassis. See your *PowerHub Installation and Maintenance Manual* for more information about this command.

If the segment number is followed by ** (two asterisks), then bridging has been disabled by the **bridging** command on that segment. Note that the bridging command does not affect routing. In this example, bridging has been disabled on segments 1.1, 1.3, 2.3, and 2.4.

Segment Name The description assigned to each segment. You can change the description using the **`media sset segment name`** command. See the *PowerHub Hardware Installation and Maintenance Manual* for more information about this command.

Spanning-tree The Spanning-Tree algorithm automatically causes segments to forward or block traffic based on the network topology. When the Spanning-Tree algorithm is enabled, this column shows one of four states:

listening
learning
blocking
forwarding
disabled

The `listening` and `learning` states occur when you first enable the Spanning-Tree feature or when your network topology changes. The `blocking` state indicates that packets are not being forwarded. The `forwarding` state indicates that packets can be forwarded on the segment. The `disabled` state indicates that the segment has been disabled using the segment command.

In this example, the Spanning-Tree feature is blocking bridge traffic on segment 1.5. The Spanning-Tree state has no effect on routing. However, this state does affect VLANs because traffic is bridged within VLANs rather than routed.

CHAPTER 11 SNMP Commands

The ASN-9000 contains an implementation of Simple Network Management Protocol (SNMP). SNMP uses User Datagram Protocol (UDP), an industry-standard connectionless protocol used to send and receive packets between a managed ASN-9000 and other devices. This chapter describes the commands located in the `snmp` subsystem and shows how to perform the following tasks:

- Display the SNMP configuration.
- Add an SNMP management community.
- Add an SNMP manager.
- Delete an SNMP management community.
- Delete an SNMP manager.
- Display SNMP packet statistics.
- Clear SNMP packet statistics.

In addition, this chapter describes how to set up files for use with SunNet Manager to access the ASN-9000 Management Information Bases (MIBs).

Using a third-party SNMP application, the ASN-9000 MIB objects can be accessed for information about the ASN-9000. The software contains implementation of standard MIBs and the ASN-9000 Proprietary MIB.

11.1 Accessing the SNMP Subsystem

To access the `snmp` subsystem, issue the following command at any runtime command prompt:

`snmp`

The following commands are available in the snmp subsystem:

```
snmp subsystem:

community|com                    manager|man
config                           stats
```

11.2 SNMP Community

The **community|com** command is used to add or delete SNMP community settings. The default configuration includes the standard default SNMP community, **public**, which has read-only access. Up to eight SNMP communities can be supported at any one time. The syntax for this command is as follows:

```
community|com add <community-name> [ro|rw]
community|com delete|del <community-name>
```

where

add	Specifies that the named community is to be added to the configuration.
del[ete]	Specifies that the named community is to be deleted from the configuration.
<community-name>	Specifies the community name to be added or deleted.
[ro|rw]	Specifies the community's access as read-only (**ro**) or read-write (**rw**). The default is read-only access.

The following example illustrates adding an **admin** community with read-write access:

```
77:ASN-9000:snmp# community add admin rw
78:ASN-9000:snmp#
```

The following command deletes the **admin** community:

```
79:ASN-9000:snmp# community del admin
80:ASN-9000:snmp#
```

11.3 Standard Traps

SNMP specifications define a series of standard traps of which the implements those listed below in Table 11.1:

Table 11.1 - Standard Traps

Trap	Conditions	OID and MIB objects	Variables
coldStart	The device has been power-cycled.	generic 0	
linkDown	This trap is produced when a link goes down due to a secure address violation, network connection error, or an explicit management disable action. The trap frame carries the index value of the port.	generic 2	ifIndex
linkUp	This trap is generated when a port is re-enabled. The trap frame contains the index value of the affected port.	generic 3	if Index
authentica-tionFailure	This trap is generated when the switch receives an SNMP message that is not accompanied by a valid community string.	generic 4	
fddiRing-Wrap	FDDI ring wrap has occured.	1.3.6.1.2.1.10.15.73.1 (fddimib-SMT1)	fddiSMTIndex
newRoot	Indicates the sending agent has become new root of Spanning Tree.	1.3.6.1.2.1.17.1 (dot1dBridge 1)	dot1dBaseBridge-Address

Table 11.1 - Standard Traps

Trap	Conditions	OID and MIB objects	Variables
topology-Change	Sent by a bridge when any of its configured ports transitions from Learning to Forwarding state, or from Forwarding to Blocking state.	1.3.6.1.2.1.17.2 (dot1dBridge 2)	dot1dBaseBridge-Address

11.4 Enterprise-Specific Traps

Table 11.2 shows the enterprise-specific traps implemented in the and lists the conditions that cause these traps to be generated, their OIDs, MIB objects, and variables:

Table 11.2 - Enterprise-Specific Traps

Trap	Conditions	MIB object	Variables
atmLinkUp	The specified interface has just left the *down* state. Slot ID is reported by trap.	1.3.6.1.4.1.326.2.6.1..2.1 (alatm 1)	alAtmAMAActual Use alATMCurrentAMA Type
atmLinkDown	Indicates a link is down and reports the slot ID for the downed interface.	1.3.6.1.4.1.326.2.6.1..2.2 (alatm 2)	alAtmAMASlotNumber alAtm PreviousAMA alAtmPreviousAMA-Type
atmCutOver	Reports a cut over from primary to backup port or vice versa.	1.3.6.1.4.1.326.2.6.1..2.3 (alatm 3)	alAtmAMASlotNumber, alAtmAMAActual Use, alAtmCurrentAMA-Type, alAtmPreviousAMA, alAtmPreviousAMA-Type
atmBootUp	Indicates start up and reports slot Id.	1.3.6.1.4.1.326.2.6.1..2.4 (alatm 4)	alAtmAMASlotNumber, alAtmAMAActual-Use, alAtmCurrentAMA-Type

Table 11.2 - Enterprise-Specific Traps

Trap	Conditions	MIB object	Variables
atmFault	Indicates a series of five or more consecutive atmLinkdowns have occured. Once atmFaults occur, atmLinkdown traps will not be sent.	1.3.6.1.4.1.326.2.6.1..2.5 (alatm 5)	alAtmAMASlotNumber
powerFailure	Indicates power failure has occured in the reported slot.	1.3.6.1.4.1.326.2.6.1..1.1 (alchassis 1)	alPSNumber
boardFailure	Indicates an intelligent card failure in the reported slot.	1.3.6.1.4.1.326.2.6.1..1.2 (alchassi 2)	alSlotNumber
alLoginFailure	The login failure trap indicates that the login failed due to some error condition during the login process.	1.3.6.1.4.1.326.2.6.2.1.15.1 (alsystem 1)	alLastLoginFailureTimeDate; alLastLoginSourceAddress; alLastLoginFailureUserId; alLastLoginFailureReason

11.4.1 SNMP Configuration

The **`config`** command is used to display the current SNMP configuration of communities and managers. The syntax for this command is as follows:

```
config [show] [-l] [<community-name>]
```

where

[-l] Optionally specifies the list of managers and trap configurations.

[<community-name>] Optionally specifies the community to display.

The following example displays the default SNMP configuration. Notice that no options are specified.

```
74:ASN-9000:snmp# config

Community                 Access
------------------------  ------
public                    ro
75:ASN-9000:snmp#
```

11.5 Displaying Statistics

The **stats** command is used to display and clear statistics on SNMP packets transmitted and received. These statistics are a superset of the corresponding statistics provided in the SNMP table of MIB-II. Two copies of each SNMP statistics counter are maintained:

- Count since last clear.
- Count since last reset.

The syntax for this command is as follows:

`stats [show] [-t]`
`stats clear`

[-t] Displays statistics since the last reset.

clear Clears all SNMP statistics.

The following example shows the **`stats`** command used both with and without the **`[-t]`** argument:

```
82:ASN-9000:snmp# stats
SNMP packet statistics (count since last stats clear):
Packets Rcvd:                  96    Packets Sent:                 93
Bad Version Rcvd:               3    Bad Comm Name Rcvd:            0
Bad Comm Uses Rcvd:             0    ASN Parse Err Rcvd:            0
Bad Type Rcvd:                  0    Too Big Rcvd:                  0
No Such Name Rcvd:              0    Bad Values Rcvd:               0
Read Onlys Rcvd:                0    Gen Errs Rcvd:                 0
Total vars Req:               417    Total vars Set:                0
Get Req Rcvd:                   0    GetNext Req Rcvd:             93
Set Req Rcvd:                   0    Get Resp Rcvd:                 0
Traps Rcvd:                     0    Too Big Sent:                  0
No Such Name Sent               0    Bad Values Sent:               0
Read Onlys Sent:                0    Gen Errs Sent:                 0
Get Req Sent:                   0    GetNext Req Sent:              0
Set Req Sent:                   0    Get Resp Sent:                93
Traps Sent:                     0

83:ASN-9000:snmp# stats -t
SNMP packet statistics (Total count since last system reset):
Packets Rcvd:                  96    Packets Sent:                 93
Bad Version Rcvd:               3    Bad Comm Name Rcvd:            0
Bad Comm Uses Rcvd:             0    ASN Parse Err Rcvd:            0
Too Big Rcvd:                   0
No Such Name Rcvd:              0    Bad Values Rcvd:               0
Read Onlys Rcvd:                0    Gen Errs Rcvd:                 0
Total vars Req:               417    Total vars Set:                0
Get Req Rcvd:                   0    GetNext Req Rcvd:             93
```

```
Set Req Rcvd:                0    Get Resp Rcvd:               0
Traps Rcvd:                  0    Too Big Sent:                0
No Such Name Sent            0    Bad Values Sent:             0
Gen Errs Sent:               0
Get Req Sent:                0    GetNext Req Sent:            0
Set Req Sent:                0    Get Resp Sent:              93
Traps Sent:                  0

84:ASN-9000:snmp#
```

11.6 Adding an SNMP Manager

The **manager|man** command is used to add or delete SNMP managers. Each community can include up to 16 managers. The SNMP manager entries include an IP address. This IP address should be the SNMP management station that any configured traps are to be sent t. The syntax for this command is as follows:

```
manager|man add <community-name> <IP-addr> [trap|notrap]
manager|man delete|del <community-name> <IP-addr>|all
```

where

add	Specifies that the SNMP manager at <IP-addr> be added and associated with the specified <community-name>.
<community-name>	Specifies the community name to which a SNMP manager is to be added.
<IP-addr>	Specifies the IP address of the SNMP manager.
[trap|notrap]	Optional flag, indicating whether the SNMP manager should receive traps or not. If the manager should receive traps, use (**trap**). If the manager should not receive traps, use (**notrap**). The default is **notrap**.
delete	Deletes the SNMP manager specified by <IP-addr> and <community-name> or all configured SNMP managers.
<IP-addr>|all	Specifies the IP address of the SNMP manager to be deleted. If all is specified, all configured SNMP managers are deleted.

In the following example, an attempt is made to add a SNMP manager at IP address 169.144.86.49 to the admin SNMP community. Since the community doesn't exist, an error message is generated. The community is then created (**com add**). The attempt to add the SNMP manager is made again and is successful. The SNMP configuration is then displayed.

```
96:ASN-9000:snmp# man add admin 169.144.86.49

ERROR: Community admin not found. Cannot add manager 169.144.86.49.
97:ASN-9000:snmp# com add admin rw
98:ASN-9000:snmp# man add admin 169.144.86.49
99:ASN-9000:snmp# config

Community                 Access
```

```
------------------------   ------
public                     ro
admin                      rw
100:ASN-9000:snmp#
```

Additionally, SNMP managers can be deleted by deleting the community they are attached to. Do this with care, as deleting the community deletes all managers attached to that community.

11.7 Using SunNet Manager

If SunNet Manager is being used to access the MIBs, the following types of files must be prepared for each MIB:

- Schema
- Trap
- OID.

Table 11.3 lists the utilities and file names in SunNet Manager used to prepare these files.

Table 11.3 - SunNet Manager Utilities

schema	A MIB converted from ASN.1 format.	mib2schema	*<MIB-name>*.schema
trap	Active traps for a particular MIB.	mib2schema	*<MIB-name>*.trap
OID	Object Identify file. Translates the Object Identifiers used by SNMP to communicate into the identifiers that SunNet Manager understands.	mib2schema	*<MIB-name>*.oid
*Where *<MIB-name>* is the name of the MIB.			

CHAPTER 12 TFTP Commands

The `tftp` subsystem contains the ASN-9000 implementation of TFTP (Trivial File-Transfer Protocol). Use the `tftp` subsystem commands to perform the following tasks:

- Set a default TFTP server IP address.
- Display the default TFTP server IP address.
- Unset the default TFTP server IP address.
- Download or display a file stored on a TFTP server.
- Upload a file to a TFTP server.
- Load (activate) a configuration file stored on a TFTP server.
- Save a configuration file to a TFTP server.

To make use of the commands in this subsystem, a TFTP server must be configured to support TFTP file transfers. The procedures for configuring a TFTP server depend upon the particular type of server being used. Refer to the appropriate server documentation for specific configuration information.

Also, the segment connecting to the TFTP server must have an IP interface defined on it. For information about adding an IP interface, refer to the *ForeRunner ASN-9000 Protocols Manual.*

The TFTP protocol provides no authentication for any services, including downloading or changing files stored on the TFTP server. If the TFTP server is configured to allow `tftp` commands to be used, anyone with access to the server can download or change files.

12.1 Accessing the TFTP Subsystem

To access the `tftp` subsystem, issue the following command at any runtime command prompt:

```
tftp
```

12.2 Considerations

The TFTP commands work with many types of TFTP servers, including servers running UNIX, DOS, Windows NT or OS/2. The following considerations apply to TFTP servers that are running UNIX, a very common platform for TFTP. Regardless of the platform used, consult the appropriate server documentation regarding either of the following:

- File permissions (not applicable to some operating systems).
- Conventions for pathnames and file names.

If problems are experienced while uploading or downloading files between the ASN-9000 and TFTP server, they can often be resolved by verifying whether read and write access to the server is required and how file names need to be specified.

12.2.1 TFTP Commands and UNIX Read/Write Permissions

To use TFTP commands to upload or download files, the proper UNIX read/write permissions must be setup on the TFTP server. On most servers, permissions are controlled separately for users, groups, and "others." The TFTP server considers the ASN-9000 to be among the "others." It is recommended that an outbound Telnet session be established witt he TFTP boot server. Refer to *Chapter 13* for details on opening an outbound Telnet session.

Read/write access to ASN-9000 files and directories can be controlled on the TFTP server by setting the read and write permissions. On most UNIX systems, permissions can be displayed using the UNIX **`ls`** command. Following is an example of the permissions information displayed for a file on a typical UNIX TFTP server.

```
$ ls -l
total 3
-rw-rw---- 1 mrspat     622 Jul 19 15:09  Lab1.env
-rw-rw-r-- 1 ethan      643 Jul 19 15:11  Lab2.env
-rw-rw--w- 1 sascha     611 Jul 19 15:13  Lab3.env
-rw-rw-rw- 1 stripie    698 Jul 19 15:15  Lab4.env
-rw-rw-rw- 1 tiger      698 Jul 19 15:15  Lab5.env
```

The text shown in bold is the permission information for each file for the "others" category.

- In this example, no read or write permissions are enabled on `Lab1.env`. Consequently, this file cannot be uploaded or downloaded with this name using the TFTP commands.
- Read, but not write, permission is granted to the file `Lab2.env` for others. This file can be downloaded or displayed, but a file using this name cannot be uploaded.
- The file `Lab3.env` cannot be downloaded. However, it can be uploaded.

- Finally, `Lab4.env` and `Lab5.env` have both read and write permissions enabled. These files can be uploaded or downloaded.

The UNIX **`chmod`** command can be used on most UNIX systems to change read / write permissions. From an open outbound Telnet session, issue the **`chmod`**, or appropriate, command to change the read / write permissions after creating the zero-file length file. Refer to the UNIX shell documentation for details.

12.2.2 Path Names

Depending upon the TFTP server configuration, path names may need to be specified when using the TFTP commands.

On some servers, when the TFTP commands are used to upload or download files, the ASN-9000 understands file names according to where the server is accessed. Only those files located in the directory accessed by the ASN-9000, or in a subdirectory of that directory, can be uploaded or downloaded if specified.

For example, suppose the TFTP server is configured to allow access to the server at a directory called TFTP.

```
TFTP
        fore
                ph
                        ethan.env
                        sascha.env
```

All directories below the TFTP directory are considered part of the pathname for the files stored there. Relative to the ASN-9000, the pathname for the files ethan.env and sascha.env is fore / ph. To download ethan.env, the following command would be issued:

```
get -a fore/ph/ethan.env ethan.env
```

where

-a	Specifies net-ASCII mode. (Files are transferred in binary mode by default.)
fore/ph/ethan.env	Source file name with path information.
ethan.env	Destination file name. This name must be in the DOS file-naming format (filename.ext).

12.2.3 File-Naming Conventions

Local file names are optional when using the **`get`** command. The local file name can be omitted if the file name is eight characters or fewer in length with an extension no longer than three characters and the name does not need to be changed.

Suppose the ASN-9000 has access to the TFTP server at the TFTP directory, as shown in the following example:

```
TFTP
        fore
                ph
                        sascha.env
                        ethan.env
                        lotsofdots
```

If the **`get`** command is issued, without specifying the local file name (**`sascha.env`**), an error message is displayed on the ASN-9000.

To download the file, `lotsofdots`, a local file name fitting the DOS file naming conventions must be specified, as shown in the following example, where `lotsofdots` is renamed `spots`.

```
get -a fore/ph/lotsofdots spots
```

12.2.4 Remote File Names

Some TFTP servers require that the remote file name exist on the server before allowing anything to be written to that file name. If this is required, create a zero-length file on the server (Unix **`touch <filename>`** command), specifying the name of the remote file name that is to be used with the **`put`** or **`savecfg`** commands.

Also, on some TFTP servers, files that are overwritten on the server are not properly truncated. When overwriting an existing file on the TFTP server, if the older version of the file is longer than the new file, the older version is not truncated properly by the server. As a result, the new version of the file contains part of the older version of the file. Do one of the following to verify that the new version completely replaces the older version of a file: Remove the older version of the file, then save the new version.

- If the server requires that the file name be present on the server before copying it, create a zero-length file with the new name then save the file under the new name. After the new file is copied to the server, delete the older version of the file and rename the new file as desired.

12.3 TFTP Commands

The commands described in the following sections allow a particular TFTP server to be specified in the file operations described in this chapter. These following commands are discussed:

```
tftp subsystem:

server                                  readcfg|rdcfg
get                                     savecfg|svcfg
put
```

12.3.1 Setting the Default Server

The **server** command is used to specify the default TFTP server. The syntax for this command is as follows:

server [show]
server set <ipaddr>
server unset

where

set When specified, sets the TFTP server to the specified <ipaddr>. If no <ipaddr> or the verb unset is specified, the current server configuration is displayed.

<ipaddress> Specifies the IP address of the TFTP server to use as the default. Specify the address in dotted-decimal notation.

unset Deletes the current TFTP server configuration.

In the following examples, the current server address is shown as unset and then a server address is specified.

```
6:ASN-9000:tftp# server
server:    (not set)
7:ASN-9000:tftp# server set 169.144.85.49
8:ASN-9000:tftp# server
server:    169.144.85.49
9:ASN-9000:tftp#
```

Only one active TFTP server can be configured at a time. Setting a new default TFTP server IP address replaces the existing TFTP server IP address.

12.4 Downloading a File

The **get** command is used to transfer a file from the configured TFTP server to a local disk file or displayed on the local terminal. The syntax for this command is as follows:

```
get [-h <host>] [-a] <remote-file> [<local-file>|tty]
```

where

[-h <host>] Specifies the IP address (in dotted-decimal notation) of the TFTP server. If this argument is not specified, the default server is used. The default server is specified using the **set server** command. (See Section 12.3.1.)

[-a] Forces the transfer to take place in net-ASCII transfer mode rather than octet mode. Octet mode transfers the file, including end-of-line characters, exactly as it is stored on the server. Net-ASCII changes the end-of-line characters to be compatible with the display or storage device that receives the file.

Use the default (octet-mode) to download software image files (ex: 7f, 7pe, 7atm, and so on). Use the net-ASCII mode to download configuration files, environment files, and other text files.

If the file is to be displayed on the management terminal (by specifying **tty** as the local file name), omit this argument. The file is automatically transferred in net-ASCII format.

<remote-file> Specifies the name of the remote file. Specify the name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `transfer`, and this directory is specified as the TFTP home directory, do not specify `transfer` as part of the file name.

[<local-file>|tty] If this argument is not specified, the ASN-9000 assumes the same file name on the server. The pathname (if any) must be included with the file name.

If a *<local-file>* argument is omitted, or a local file name is specified, the file is written to a local storage device.

If a local device is not specified, the file is written to the default-device. To specify a device, preface the file name with **fm:** (Flash Memory Module) or **fd:** (Floppy Diskette).. If the system was booted over the network, the **fm:** is the default device.

If the file name on the server is an invalid pathname on the ASN-9000, an error message is displayed.

If **tty** is specified, the file is not downloaded but an image of the file is displayed on the management terminal. The file can be displayed from within a TTY (RS-232) session or a TELNET session.

If a TFTP server name is not specified and no default server name has been configured, an error message is displayed. To configure a default server name, use the **server set** command. (See Section 12.3.1.)

12.5 Uploading a File

The **put** command is used to transfer a file to the configured TFTP server. The syntax for this command is as follows:

```
put [-h <host>] [-a] <localfile> [<remote-file>]
```

where

-h <host> Specifies the IP address, in dotted-decimal notation, of the TFTP server. If this argument is not specified, the default TFTP server is used. The default TFTP server is specified using the **set server** command. (See Section 12.3.1.)

-a Forces a net-ASCII transfer. If not specified, octet mode is used to transfer the file. Octet mode transfers include end-of-line characters, transferring the file exactly as it is stored on the server. Net-ASCII changes the end-of-line characters to be compatible with the display or storage device that receives the file.

Use the default (octet-mode) to download software image files (ex: 7f, 7PE, ppu. 7PE, and so on). Use the net-ASCII mode to download configuration files, environment files, and other text files.

<local-file> Specifies the local file name.

If a local device is not specified, the file is written to the default-device. To specify a device, preface the file name with **fm:** (Flash Memory Module) or **fd:** (Floppy Diskette).. If the system was booted over the network, the **fm:** is the default device.

<remote-file> Specifies the name of the file as it is to appear on the server. Specify the name that is meaningful to the TFTP program on the server. For example, if the name, with the path of the server, contains a subdirectory called `transfer` and this directory is specified as the TFTP home directory, do not specify transfer as part of the file name.

The following procedure shows the steps required to upload the default configuration file (**`cfg`**) to the configured TFTP server from the ASN-9000.

1. Open an outbound Telnet session with the remote TFTP host.

```
29ASN-9000:tftp# telnet open 169.144.86.49
Trying 169.144.86.49...
Connected to 169.144.86.49.
Escape character is '^Y'.

SunOS UNIX (fabrique)

login: username
Password:
Last login: Mon Mar  2 07:57:39 from username
SunOS Release 4.1.4 (GENERIC) #2: Fri Oct 14 11:08:06 PDT 1994
```

2. On the remote TFTP host, change to the `tftpboot` directory.

```
fabrique-username:51=> cd /
fabrique-:52=> cd tftpboot
```

3. In the `tftpboot` directory, create a zero-length file called **`cfg`**.

```
fabrique-tftpboot:56=> touch cfg
```

4. Escape back to the ASN-9000 (`Ctrl+Y`).

```
fabrique-tftpboot:57=> Escape to Command line mode. Type 'open' to return.
```

5. Issue the **`put`** command to upload the file. Notice the use of the **`-a`** option, since the `cfg` file is an ASCII file.

```
31ASN-9000:tftp# put -a cfg
tftp: Peer generated error
protocol error: Permission denied: Access violation
```

6. Notice that an error was received. To correct the error, re-open the outbound Telnet session and display the read / write permissions for the cfg file created in step 3.

```
32ASN-9000:tftp# telnet open

fabrique-tftpboot:57=> ls -al
total 3
```

```
drwxrwxrwx  3 root          512 Mar  2 08:12 .
drwxr-xr-x 26 root         1024 Jan 19 13:27 ..
-rw-r--r--  1 username        0 Mar  2 08:12 cfg
drwxrwxrwx  4 username      512 Mar  2 08:02 fore
```

7. Note that the `cfg` file does not have write permissions. Issue the UNIX **`chmod`** command to change the read / write permissions to allow writing to the file and then display the files to verify the read / write permissions were changed.

```
fabrique-tftpboot:58=> chmod 777 cfg
fabrique-tftpboot:59=> ls -al
total 3
drwxrwxrwx  3 root          512 Mar  2 08:12 .
drwxr-xr-x 26 root         1024 Jan 19 13:27 ..
-rwxrwxrwx  1 username        0 Mar  2 08:12 cfg
drwxrwxrwx  4 username      512 Mar  2 08:02 fore
```

8. Escape back to the ASN-9000 (`Ctrl`+`Y`) and re-attempt the upload.

```
fabrique-tftpboot:60=> Escape to Command line mode. Type 'open' to return.
33ASN-9000:tftp# put -a cfg
169.144.86.49:cfg:   28553 bytes
```

9. Notice that this time the transfer was successful. Re-open the outbound Telnet session and display the files present to verify a successful transfer

```
34ASN-9000:tftp# telnet open

fabrique-tftpboot:60=> ls -al
total 31
drwxrwxrwx  3 root          512 Mar  2 08:12 .
drwxr-xr-x 26 root         1024 Jan 19 13:27 ..
-rwxrwxrwx  1 username    28553 Mar  2 08:13 cfg
drwxrwxrwx  4 username      512 Mar  2 08:02 fore
fabrique-tftpboot:61=>
```

In the following example, an environment file is uploaded to a UNIX server in a subdirectory (`fore/configs`) of the `tftpboot` directory.

```
40ASN-9000:tftp# put myenv fore/configs/myenv
169.144.86.49:fore/configs/myenv:      92 bytes
41ASN-9000:tftp#
```

Notice that a pathname is specified with the file name in this example. Ensure a pathname that is meaningful to the TFTP program is specified.

12.6 Read Configuration

The **readcfg|rdcfg** command is used to read (load) a ASN-9000 configuration file that is stored on a remote TFTP server. The syntax for this command is as follows:

readcfg|rdcfg [-v] [-h <host>] <remote-file>

where

-v Displays the configuration commands as they are executed.

-h <host> Specifies the IP address of the TFTP server. If not specified, the default TFTP server is used. (The default TFTP server is specified using the **server set** command (see Section 12.3.1).

<remote-file> Specifies the name of the configuration file to read. Specify a name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `configs` and this directory is specified as the TFTP home directory, do not specify **configs** as part of the file name.

As with the **get** command, if a host server name is not specified and no default server name has been configured, an error message is displayed.

The following example reads (loads) the configuration file (**cfg**) from the remote `tftpboot` server in the `fore/configs` directory. An outbound Telnet session is opened first to effect the transfer. The outbound Telnet session is not closed during this process.

```
67:ASN-9000:tftp# readcfg cfg
System name set to 'ASN-9000'.
System location set to:
Undefined
dcd-detection disabled
Bridge Table aging time set to 60 minutes
.
.
.
68:ASN-9000:tftp#
```

12.7 Save Configuration

The **savecfg|svcfg** command is used to save the current configuration to a remote TFTP host. To save a configuration to a remote TFTP host, make sure a TFTP file already exists on the host to which the configuration can be saved. The syntax for this command is as follows:

```
savecfg|svcfg [-h <host>] <remote-file>
```

where

-h <host> Specifies the IP address of the TFTP server. (The default server is specified using the **set server** command (see Section 12.3.1).

<remote-file> Specifies the name of the configuration file to be saved. Specify a name that is meaningful to the TFTP program on the server. For example, if the server contains a subdirectory called `configs` and this directory is specified as the TFTP home directory, do not specify **configs** as part of the file name.

On UNIX-based TFTP servers, if write permission for "others" is not enabled for the configuration file name or the directory to which the file is being written, a message such as the following is displayed:

```
16:ASN-9000:tftp# savecfg cfg
tftpWrite: Peer generated error
tftp: Permission denied: Access violation
17:ASN-9000:tftp#
```

If this error is received, check the file and directory permissions for "others" on the TFTP server.

If the UNIX-based server requires that the file name already exist, but the file does not yet exist on the server, a message such as the following is displayed:

```
18:ASN-9000:tftp# savecfg cfg
tftpWrite: Peer generated error
tftp: File not found: File not found
19:ASN-9000:tftp#
```

The following example shows a successful execution of the **savecfg** command to the default remote host directory.

```
70:ASN-9000:tftp# savecfg cfg
71:ASN-9000:tftp#
```

CHAPTER 13 Telnet Commands

This release of *ForeThought* software for the *ForeRunner* ASN-9000 includes the ability to perform an outbound telnet session from within the ASN-9000 user interface. Commands in the telnet subsystem are provided to allow an outbound telnet session. These commands are:

```
telnet subsystem:

open                                status
close
```

13.1 Accessing the Telnet Subsystem

To access the `telnet` subsystem, issue the following command from any command prompt:

`telnet`

The `telnet` subsystem contains three commands. These commands are **`open`**, **`close`** and **`status`**. The following paragraphs describe the syntax for these commands.

13.2 Opening a Telnet Session

The **open** command is used to open an outbound telnet client session to a remote host whose IP address is specified <ipaddr>. The optional parameter, [<TCP port>], specifies a remote telnet server listening TCP port. The default value is TCP port 23. The syntax for this command is as follows:

open <ipaddr> [<TCP port>]

where

<ipaddr> Specifies the IP address of the remote device to open the Telnet session.

[<TCP port>] Optionally used to specify a TCP port if the default TCP port 23 is not used.

Entering **open <ipaddr>** from the telnet system prompt displays the following information:

```
80:ASN-9000:telnet# open 169.144.86.49
Trying 169.144.86.49...
Connected to 169.144.86.49.
Escape character is '^Y'.


SunOS UNIX (fabrique)

login:
```

Only two telnet client sessions can be opened from the ASN-9000 at a time.

When the **open** command is executed with a valid <ipaddr>, the system attempts to connect to the requested address and the information is echoed back to the console. Additionally, a keyboard shortcut is available to return to the ASN-9000 system prompt. Pressing the Control key with the 'Y' (`Ctrl+Y`) key from the active host acts as a shell command returning the user to the ASN-9000 system prompt.

13.3 Closing a Telnet Session

The `close` command closes the current telnet client session. The syntax for this command is as follows:

`close`

To use the `open` command to exit from an active telnet client session, the `Ctrl+Y` keyboard shortcut must be used to shell back to the ASN-9000 system prompt. The system responds as shown below:

```
86:ASN-9000:telnet# close
Telnet session Disconnected.
87:ASN-9000:telnet#
```

It is also possible to exit from the active telnet client session by logging out of the connected host. This terminates the session and returns the user to the ASN-9000 system prompt as shown below:

```
SunOS Release 4.1.4 (GENERIC) #2: Fri Oct 14 11:08:06 PDT 1994
fabrique-dspreadb:51=> logout
88:ASN-9000:telnet#
```

13.4 Viewing Telnet Status

The `status` command displays the current telnet client status information. The syntax for this command is as follows:

`status`

Issuing **`status`** from the telnet system prompt displays the following information:

```
82:ASN-9000:telnet# status
Connected to 169.144.86.49
Escape character is '^Y'.
83:ASN-9000:telnet#
```

To execute the status command with an open telnet client session, the user must escape to the ASN-9000 user interface with the `Ctrl+Y` keyboard shortcut.

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